SEPTEMBER, 1944 VOL. 33 No. 7

Periodical
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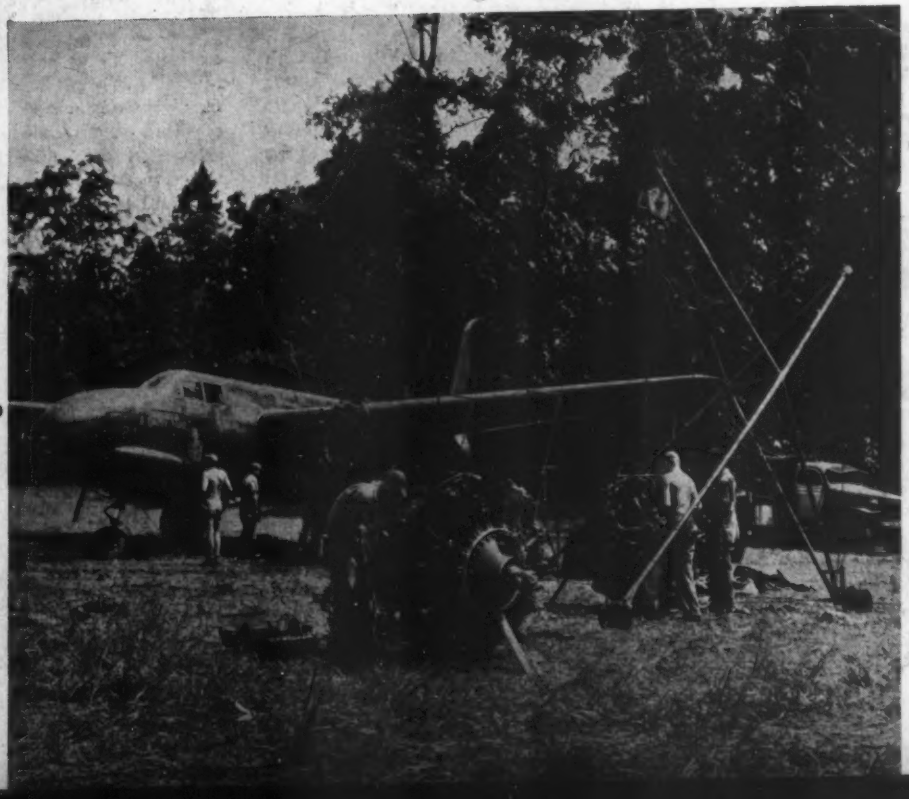
INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

THE SHOP TEACHERS' PROFESSIONAL MAGAZINE



Whose eternal vigilance for what human liberty?

• The lads that crowd our classrooms today are this generation's investment in the future. Tomorrow they will be men, representatives of our dreams, hopes and aspirations for a better world. Yet the war has shown us that such a better world is no matter of easy, comfortable inheritance, but of struggle vigilance, courage, discipline and ideals. Nor are *these* latter qualities a matter of divine heritage. These too must be fought for . . . and the eternal vigilance of the educator is one of the prices to be paid for the human liberty we all want. In *his* vigilance is the measure, the honor and the worth of his calling.

For no one knows how to easily instill high standards in a growing lad. No one knows surely how to give direction to a youngster's restless desires . . . how to fortify his will, how to fan into flame the spark that resides in the breast of all. Only as the educator is ever on the alert can he find and apply those influences that make so tremendous a difference in the lives of the boys he teaches.

For example, when a youngster first comes to drafting class: how shall the instruments he will use be selected? Shall they be carelessly chosen and cavalierly treated? Is it reasonable to expect that carelessness here will lead to carefulness in work? Yet in this class there is a golden opportunity to capture a boy's interest at its flood and so lead him on to discriminating standards, a concern for craftsmanship, a sense of the disciplines so necessary in adult life. In his drawing instruments there is an opportunity to create pride of possession, forerunner of pride in craftsmanship, which can lead to the habit of doing *all* things well. Shall the keynote of this introduction be indifference? Shall his drawing instruments be anything but the best he can afford? It would seem that poorly made, carelessly selected drawing instruments cannot be an economy, but are the final and most intolerable extravagance of all.

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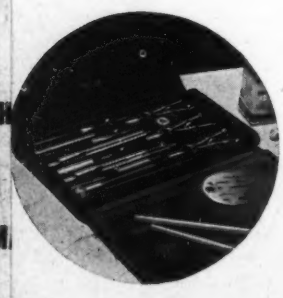

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ARMY E NAVY

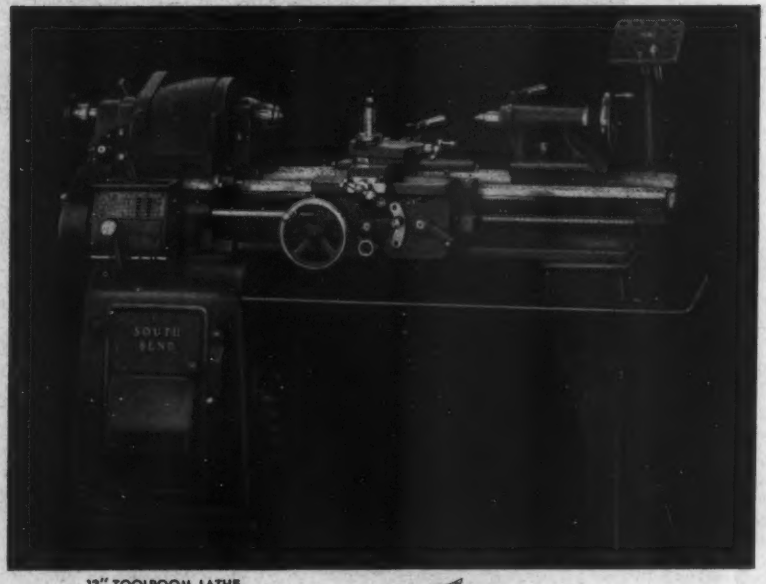
DIETZGEN

EVERYTHING FOR DRAFTING AND SURVEYING

FOR RE-TRAINING MILLIONS OF RETURNING SERVICEMEN—AND THOSE WHOSE WAR-TIME JOBS ARE OVER

War's end will project a problem of re-training and instruction for millions of men and women—young men of the armed forces who have never known peace-time employment—men who will need refresher courses on today's modern machines—women whose war-time jobs have been finished. Certain it is, that obsolete equipment for shop instruction cannot contribute to the efficiency that such a program will require. Peace-time production will call for modern equipment.

The wide use of South Bend Lathes in industry makes them especially practical for post-war re-training programs. Their modern design, their ease of operation, and their dependable precision, which have made them an outstanding choice in war industries, recommend them to shop instructors as well as trainees.



13" TOOLROOM LATHE

GET THESE TRAINING HELPS

In planning your post-war program, South Bend can help with books, sound films, wall charts and bulletins on the care and operation of a lathe. All are available to instructors. Write today for circular No. 21-D describing these training helps.

BUY WAR BONDS—SAVE FOR LATHES

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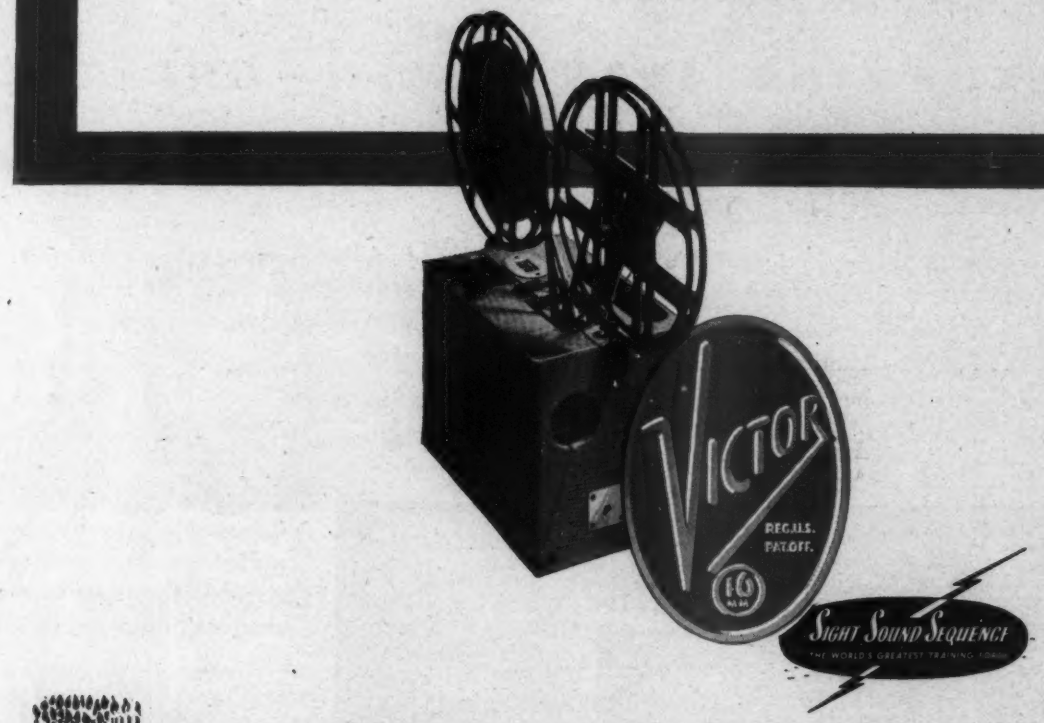
16mm Industry Becomes of Age



NOW TWENTY-ONE YEARS OLD . . .

August 12, 1923, marked the birth of a new industry—an American industry that has now come of age.

Victor is proud to have played such an important part in the inception and development of the 16 millimeter industry in which vision, ingenuity and devoted adherence to the principle of the safety standard have brought about such outstanding achievements — accomplishments which penetrate to every corner of the globe.

The growth of the 16 millimeter industry, since Alexander F. Victor invented and produced the first 16 millimeter camera and projector and the Eastman Kodak Company produced the first 16 millimeter film, is a story typical of American ingenuity and enterprise. At first, like any human infant, 16 millimeter was confined entirely within the home . . . then, in a few years it went to school, where it rapidly showed its great adaptability. As it emerged from adolescence it was called into the business world . . . and now, grown to manhood, it has matured to meet the severest test of all, training our soldiers and production workers, to speed and facilitate the defeat of our enemies. In the peaceful world of tomorrow, its horizons and possibilities are limitless—for entertainment, education, training and selling.

To Alexander F. Victor, champion of the 16 millimeter cause from the beginning, and to his contemporaries in the industry who shared his faith and have contributed much to the development and progress of 16 millimeter films and equipment, the Victor organization offers a salute on this, the 21st birthday of the 16 millimeter industry.

Alexander F. Victor, designer and producer of the first 16mm movie equipment

ALEXANDER F. VICTOR, President of the Victor Animatograph Corporation, designed and produced the first 16mm camera and projector in 1923. As early as 1918 Victor sponsored the cause of a separate, distinct safety size for non-theatrical film and equipment. His many inventions have been a major factor in the progress and present high standing of the 16mm industry.

SECOND SECTION

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AND LEADER

SIXTY-EIGHTH YEAR—No. 231. DAVENPORT, IOWA, SUNDAY MORNING, AUGUST 13, 1933. EDITORIAL, THEATERS, SPORT CLASSIFIED ADS

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at very low cost and with guaranteed success

Through revolutionary changes of design and construction and the invention of a radically new and simplified mechanism performing work formerly done by many and complicated parts A. F. Victor has opened up to the amateur the marvelous field of motion-photography.

Victor Cine-Camera

The Victor Cine-Camera

with the new reversible 16 Millimeter film

Puts life into Your Pictures at a New Low Cost that Everyone Can Afford. Low Camera Cost and Low Film Expense Renders Motion Picture Photography as Inexpensive as Taking Ordinary Lifeless Stills

At Home, a life-motion history of the family will soon become your most cherished possession and a priceless heirloom. Make only a few feet of film, two or three times each year, of all the members of the family and add the scenes together, year by year, to the modern "family album" in motion pictures. Every event of personal importance and interest is easily recorded with the Victor Cine-Camera.

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If Interested in Sports, make motion pictures at the games, meets and races, giving you a realistic record in action and sound. The high lights of a hunting or fishing trip can be brought home to realistic force.

News Pictures of your own make may be taken from time to time, soon giving you an interesting and valuable collection of scenes of historical public events.

In Business, the Victor Cine-Camera is used in various ways. This subject will be discussed in detail if you are interested.

Anyone over twelve years of age can make perfect motion pictures of professional quality with the Victor Cine-Camera

THE VICTOR CINE-CAMERA

[illegible] Victor Cine-Camera [illegible] motion picture [illegible]

The Price is $56. Tax Paid

EASTMAN CINE-KODAK 16 MILLIMETER DAYLIGHT LOADING FILM IS USED

After exposure in the camera the film is mailed to the Eastman Laboratories for development and reversal, and is quickly returned post paid, ready for showing. Each 100 foot spool permits the taking of a scene up to nearly five minutes duration, or several short scenes as desired, with one loading of the camera.

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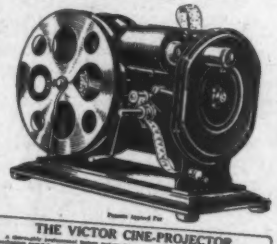
Price per 100 foot spool (including all finishing charges) $6.00

The Victor Cine-Projector

Shows Your Pictures on the Screen with Truly Professional Perfection. The Image is Rock-Steady, Flickerless and Brilliant.



Victor Cine-Projector

Place the Victor Cine-Projector on a stand or table about fifteen feet from the wall. In two minutes you have the film "threaded" ready for showing.

Attach the plug on the end of the eight-foot cord, to any convenient lamp socket and turn on the current.

Then everything is in readiness to show your family and your friends the pictures you have taken with the Victor Cine-Camera.

You will be proud of the results. There on the screen are the pictures you "shot" in all the realism of the original.

If someone says "Wait a minute—let's see that scene"—just stop the projector and let the picture stand still. Run slow or fast, as you wish, to get the best effect.

The Victor Cine-Projector is so simple that it takes only ten minutes for anyone to learn to run it.

THE VICTOR CINE-PROJECTOR

[illegible] The size is 6x12x8 inches. Weight 12 pounds.

The Price is $45 complete ready for service.

The Victor Cine-Camera and Victor Cine-Projector are guaranteed for mechanical and optical perfection and to equal every claim for completely satisfactory service.

Manufactured by the

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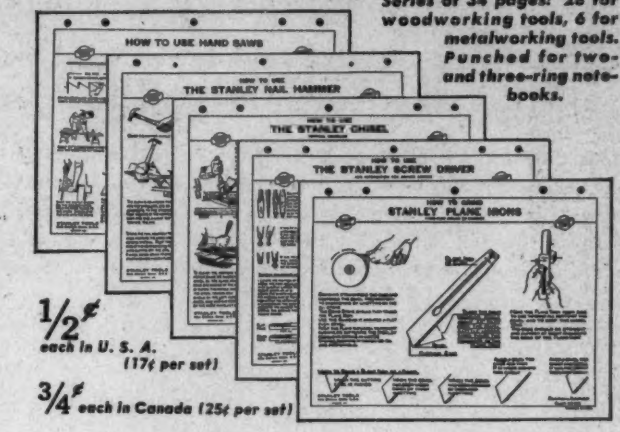

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The Ideal T Square for engineers and students. Laminated plastic with movable head. Can be fitted with swivel-type head.

ESCO plastic compass has pre-setting lead point. Is well-constructed and neat in appearance. Over 50,000 in use.

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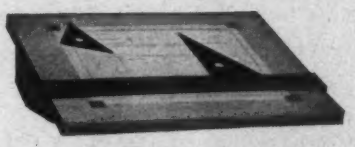

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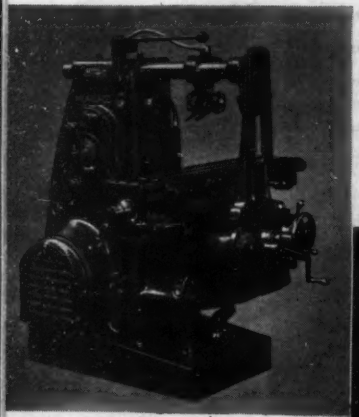

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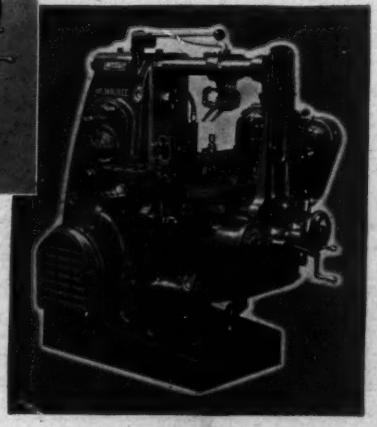
Compact, complete—with all tried and tested features usually found only in larger machines . . . low in height . . . minimum floor space . . . full back column . . . centralized controls.



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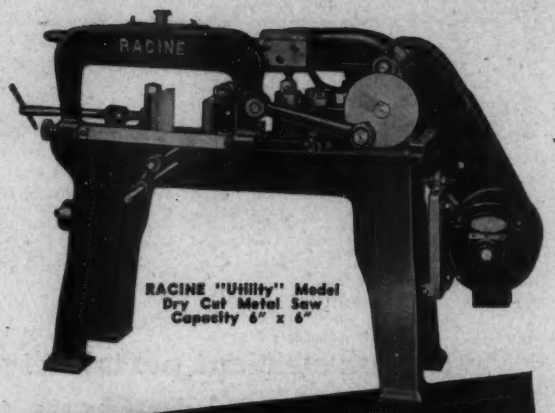

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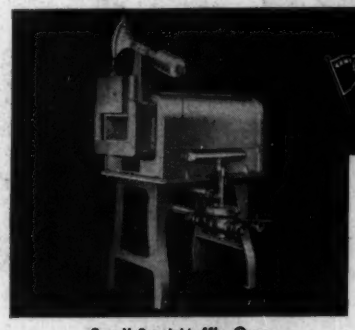

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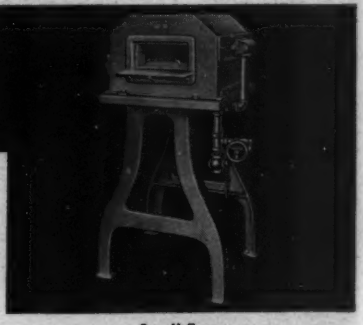

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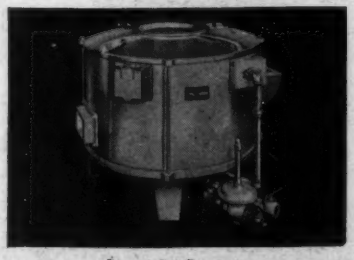
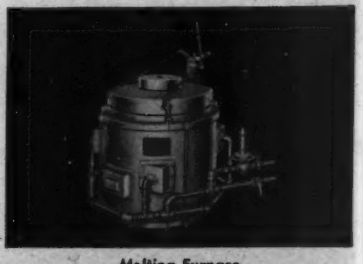
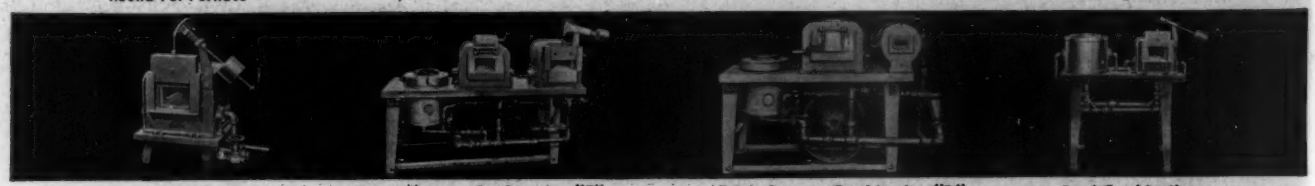


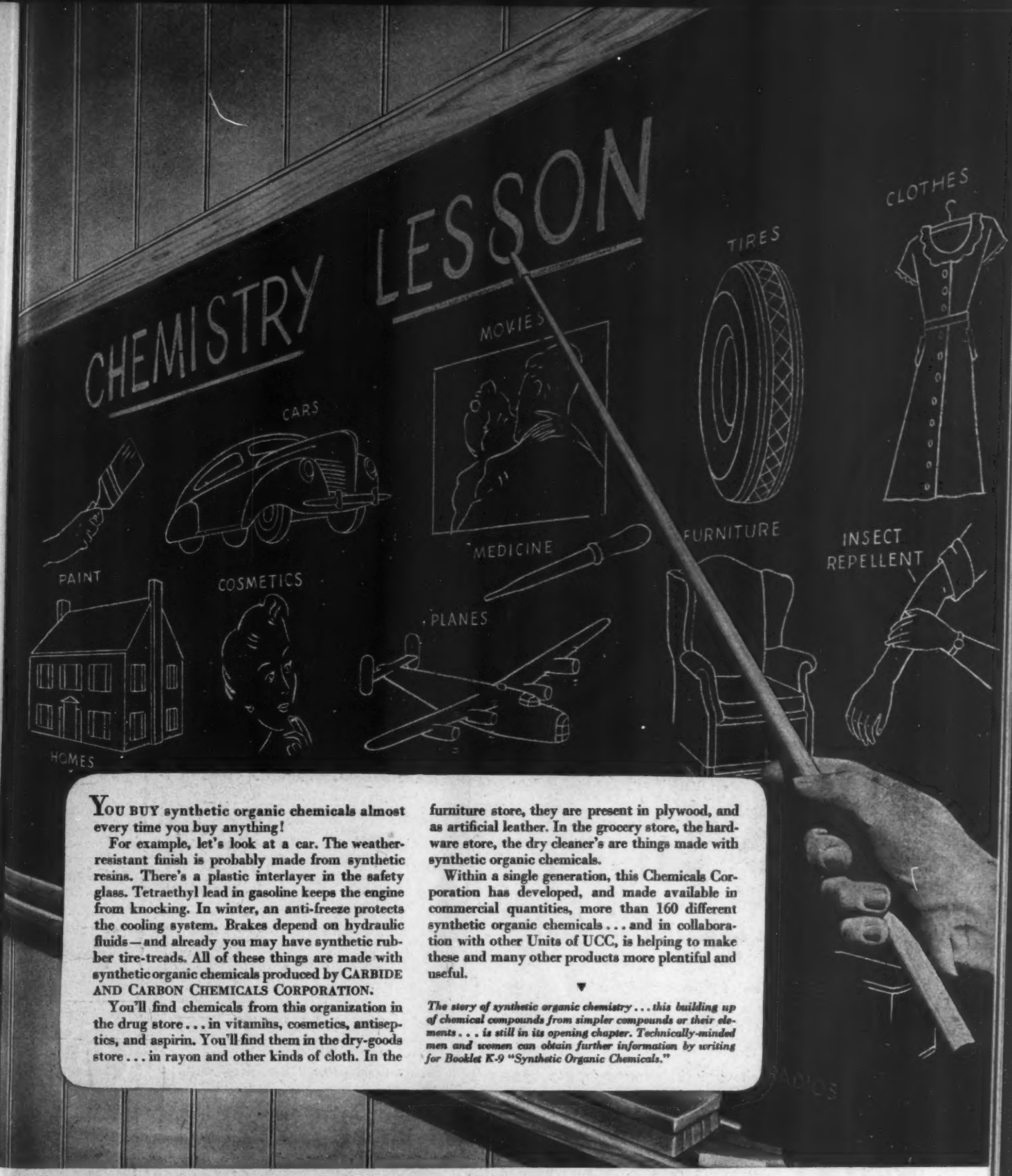
Round Pot Furnace



Melting Furnace



Bench Oven Furnace — *Triple Purpose Combination "E"* — *Triple Purpose Combination "D"* — *Dual Combination*



YOU BUY synthetic organic chemicals almost every time you buy anything!

For example, let's look at a car. The weather-resistant finish is probably made from synthetic resins. There's a plastic interlayer in the safety glass. Tetraethyl lead in gasoline keeps the engine from knocking. In winter, an anti-freeze protects the cooling system. Brakes depend on hydraulic fluids—and already you may have synthetic rubber tire-treads. All of these things are made with synthetic organic chemicals produced by CARBIDE AND CARBON CHEMICALS CORPORATION.

You'll find chemicals from this organization in the drug store . . . in vitamins, cosmetics, antiseptics, and aspirin. You'll find them in the dry-goods store . . . in rayon and other kinds of cloth. In the furniture store, they are present in plywood, and as artificial leather. In the grocery store, the hardware store, the dry cleaner's are things made with synthetic organic chemicals.

Within a single generation, this Chemicals Corporation has developed, and made available in commercial quantities, more than 160 different synthetic organic chemicals . . . and in collaboration with other Units of UCC, is helping to make these and many other products more plentiful and useful.

▼

The story of synthetic organic chemistry . . . this building up of chemical compounds from simpler compounds or their elements . . . is still in its opening chapter. Technically-minded men and women can obtain further information by writing for Booklet K-9 "Synthetic Organic Chemicals."

BUY UNITED STATES WAR BONDS AND STAMPS

UNION CARBIDE AND CARBON CORPORATION

30 East 42nd Street UCC New York 17, N. Y.

Principal Units in the United States and their Products

ALLOYS AND METALS
Electro Metallurgical Company
Haynes Stellite Company
United States Vanadium Corporation

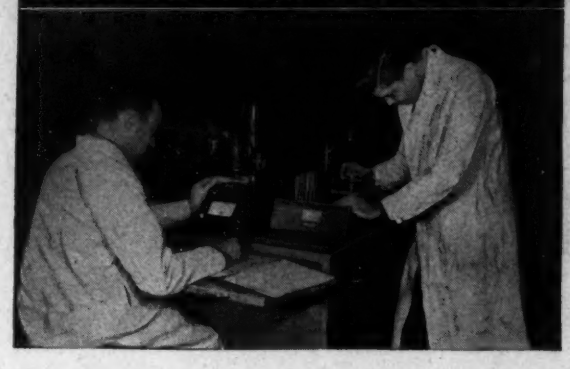
CHEMICALS
Carbide and Carbon Chemicals Corporation

ELECTRODES, CARBONS AND BATTERIES
National Carbon Company, Inc.

INDUSTRIAL GASES AND CARBIDE
The Linde Air Products Company
The Oxweld Railroad Service Company
The Prest-O-Lite Company, Inc.

PLASTICS
Bakelite Corporation
Plastics Division of Carbide and Carbon Chemicals Corporation

Inspection on Location with DoALL *Mobile Unit*



A complete inspection department on wheels, used by manufacturers to check parts right at the machine or bench. Errors can thus be caught where they start and hundreds of dollars in wasted man hours and material are saved.

The Unit consists of an 83-piece set of DoALL Gage Blocks, 20 auxiliary instruments, surface plate, Metron Comparator Gage, a file for records, desk space and collapsible seat. Occupies only 24 x 42" floor space.

Doing a Great Big Job

These 83 little jewels of industry can turn an ordinary machine shop into a manufacturer of precision parts accurate to within ± .000002" (2 millionths of an inch).

Every school shop should include instructions on Gage Blocks and have a set on hand for demonstration.

Send for 64-page Handbook on the modern use and care of Gage Blocks. It's free.

CONTINENTAL MACHINES, INC.

Manufacturers of DoAll Contour Machines and Surface Grinders.
Offices in Principal Cities
1362 S. Washington Ave., Minneapolis 4, Minn.

Photo courtesy Federal Telephone and Telegraph Corporation Soldering School.

KESTER Means Better Soldering in Any Language

Centuries ago, the ancient and honorable ancestors of this Chinese boy knew about soldering. But they didn't know about Kester — the famous flux filled solders that today, make soldering operations fast and sure.

Manufacturers and shops all over the world use Kester Flux-Filled Solder. They are industry's standard, because work is faster — results uniform and permanent.

Teach your classes with genuine Kester Flux-Filled Solder, the same kind they'll use "on the job." Beginners learn easily because the flux is self-contained right in the core of the Solder. Flux and alloy, both in the proper amount, are applied in one simple operation — no messy separate flux to spatter benches and floors.

Make Kester Flux-Filled Solder your shop standard. Students will learn quicker, do better work — reflecting credit on you, their instructor. Order from your wholesaler.

★ **BUY WAR BONDS** ★

KESTER SOLDER COMPANY
4257 Wrightwood Ave. Chicago 39, Illinois
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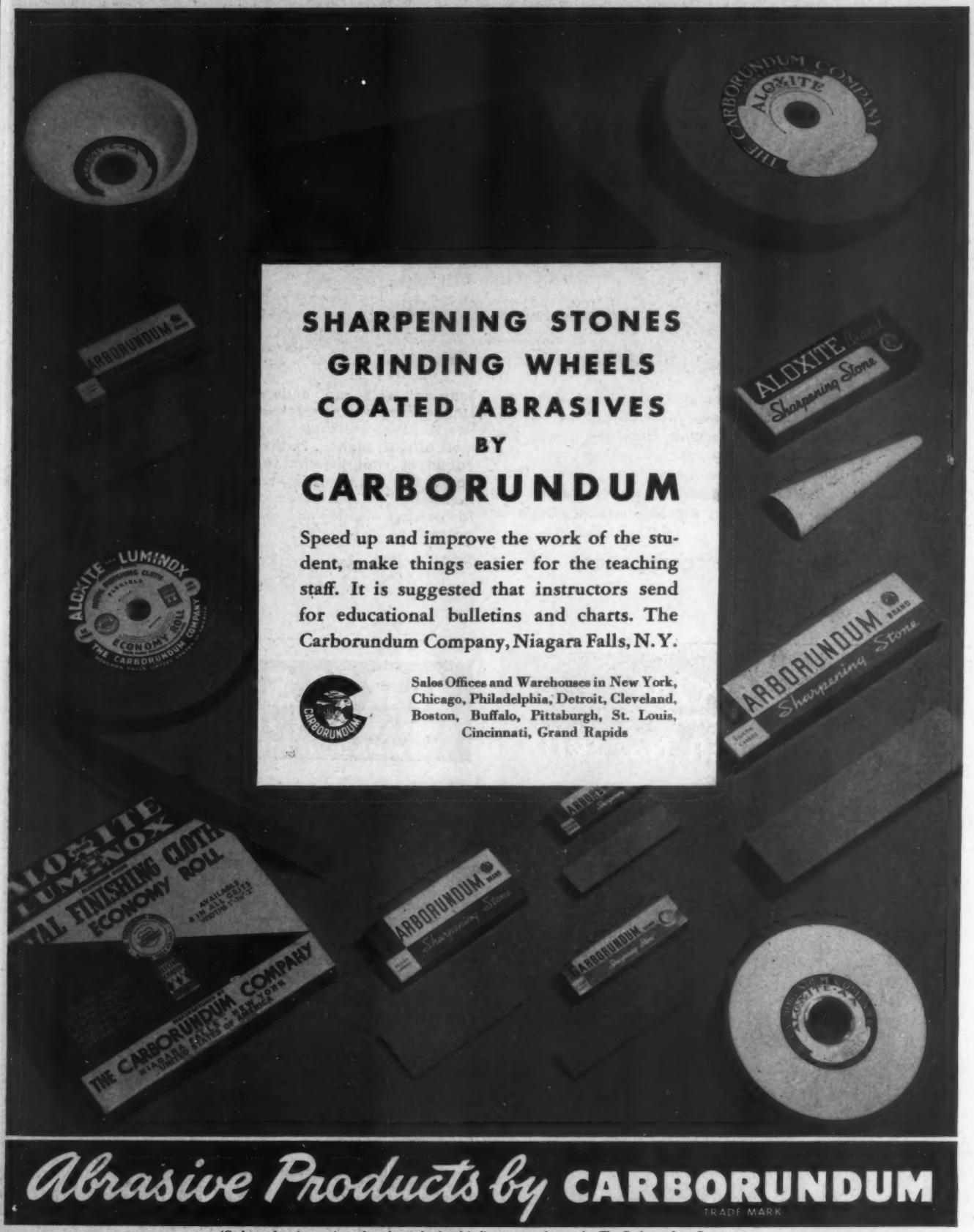
Finest Quality FOR 45 YEARS 1899-1944 KESTER SOLDER

KESTER
FLUX-FILLED SOLDER


SHARPENING STONES
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COATED ABRASIVES
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CARBORUNDUM
Speed up and improve the work of the student, make things easier for the teaching staff. It is suggested that instructors send for educational bulletins and charts. The Carborundum Company, Niagara Falls, N.Y.
Sales Offices and Warehouses in New York, Chicago, Philadelphia, Detroit, Cleveland, Boston, Buffalo, Pittsburgh, St. Louis, Cincinnati, Grand Rapids
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Train them with the tools they'll be using on the job! There is every advantage in having your students work with fine tools during the formative training period. They get the "feel" of precision, speed and power. They gain enduring respect and preference for the quality of tools that will help advance them in their craft.

Snap-on tools are endorsed and used for maintenance by every leading American airline . . . they are chosen for production in foremost aircraft plants . . . they are helping speed output in vital defense factories . . . for 24 years the name "Snap-on" has meant tool leadership in the automotive industry. Write for catalog showing the complete line of Snap-on tools.

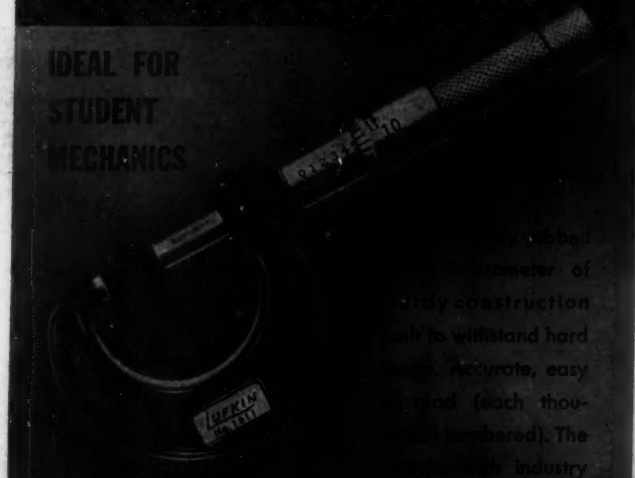
SNAP-ON TOOLS CORPORATION

8074-I 28th Avenue, Kenosha, Wisconsin

LUFKIN

MICROMETER No. 1911

IDEAL FOR STUDENT MECHANICS



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TAPES · RULES · PRECISION TOOLS

ARMSTRONG

TURRET LATHE AND SCREW MACHINE TOOLS

Today, America Needs TURRET LATHE and SCREW MACHINE OPERATORS

The transition from tooling-up to all-out production has increased the need for turret lathe and screw machine operators. When preparing your courses to help fill this need it would be well to build them around ARMSTRONG TURRET LATHE and SCREW MACHINE TOOLS. These are provided for the basic operations, and take standard drills and knurls or cutters that anyone can quickly grind from stock shapes of high speed steel. Permanent, multi-purpose tools, they reduce tooling-up to the selection of cutters, adjustment for clearance and tightening of set screws.

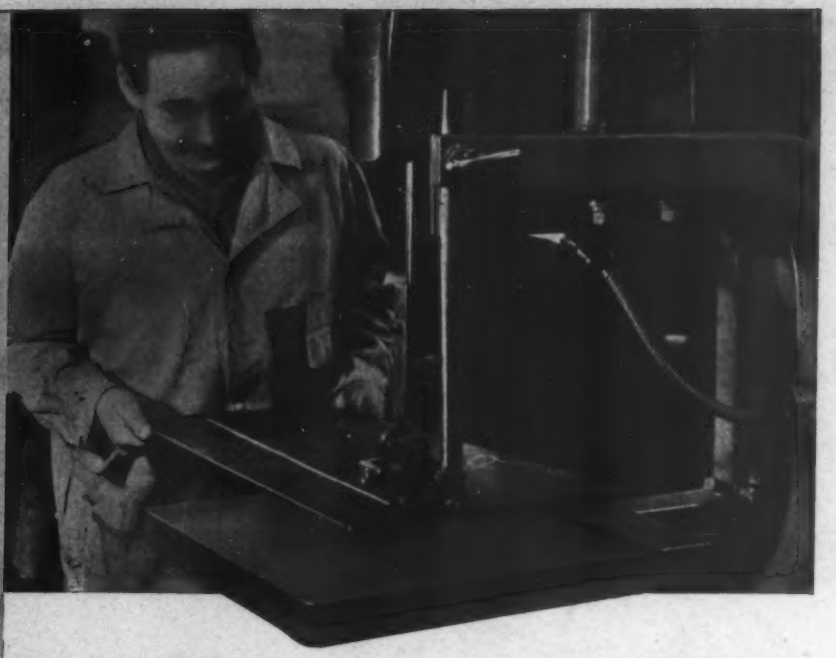
Write for catalog C-39a

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People" 322 N. Francisco Ave., Chicago, U. S. A.

Eastern Warehouse & Sales: 199 Lafayette St., New York

Students HIT THEIR STRIDE QUICKER WITH WALKER-TURNER MACHINE TOOLS!



Streamlined Walker-Turner Machine Tools are so easily and safely operated that students "catch on" rapidly . . . develop a facility that enables them to concentrate on the project rather than on the machine . . . save tedious hours in the "breaking-in" period. And, when you're ready to assign projects, you'll find Walker-Turner Machine Tools capable of handling a wide variety of operations, on materials ranging from tool steel to plastics — because of their outstanding flexibility and exceptionally wide ranges of cutting speeds.

Rugged construction that stands up under hard usage . . . performance job-tested in thousands of industrial applications . . . and prices within easy reach of school budgets . . . are additional reasons why Walker-Turner Machine Tools are your best choice for a training program packed with the "meat" of industrial realism. Send for our catalog.

WALKER-TURNER CO., INC.
Berckman Street Plainfield, N. J.

BAND SAWS—14" and 16" models. Back gearing and cone pulley provide speed range from 61 to 5300 s.f.m. for cutting practically any material from tool steel to wood.

20 INCH DRILL PRESSES—Hand or power feed, in bench, floor and multiple spindle models. Spindle speeds 260-5200 r.p.m. Capacity 1" in cast iron, ¾" in steel.

walker-Turner COMPANY, Inc. PLAINFIELD, N.J. U.S.A.

MACHINE TOOLS

DRILL PRESSES — HAND AND POWER FEED • RADIAL DRILLS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

6-10

Victory is spelled
P-R-E-C-I-S-I-O-N

The difference between victory and defeat is often measured in 10,000ths of an inch. The weapons that stand up in combat are the ones that were held within the designers' tolerance limits.

Making sure that weapons are right before they leave the factory is a job that has been increasingly assigned to Millers Falls Precision Tools. That's why vocational training requires the use of these tools . . . the same tools that are needed to shape Victory.

The picture shows a few of the precision items in the Millers Falls wartime line. Details are available on request.

Calipers and Dividers • Feeler Gages
Surface Gages • Micrometers • Depth Gages
Combination Sets • Steel Rules • Center Gages
Screw Pitch Gages

MILLERS FALLS TOOLS
SINCE 1868

MILLERS FALLS COMPANY GREENFIELD, MASS.

Teach the boys *TODAY...* with the glue they'll use *TOMORROW*

WELDWOOD GLUE is a real craftsman's "tool". Its tremendous bonding power grips wood joints in an "invisible clamp".

By using Weldwood Glue your students develop technical skill that will be of *practical* advantage in their future trades.

Every woodworker likes it . . . because it saves time and holds fast.

It's cold-mixing . . . cold-spreading . . . cold-setting!

These are classroom advantages, too.

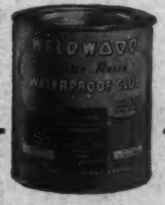
Weldwood Glue is packed in fine powder form, and mixes with ordinary tap-water to form a smooth, easily spread preparation. Sets so fast that jobs can be handled a few hours after clamping.

Stain-free and odorless, it is available in 1⅛ oz., 3½ oz., 8 oz., in 1, 5, 10, and 25 lb. cans, and in 100 lb. drums from your supply dealer.

For full information, literature and sample, mail the coupon below.

"MAKES THE GLUE LINE THE SAFETY LINE"

WELDWOOD
PLASTIC RESIN
WATERPROOF GLUE



UNITED STATES PLYWOOD CORPORATION
Weldwood Glue Dept. 141,
55 West 44th Street, New York 18, N. Y.
Please send literature, prices and samples of Weldwood Glue:—

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THE RECORD BREAKER DOES A BETTER JOB TODAY

Once they crowned the shoreline, watched him outdistance all challengers—sport past the final buoy. Now, in time of war, his ability and skill are put to a more difficult, dangerous task. He looks different. But his character is unchanged. Plumb, too, has donned a service uniform. Some of the fine finish is gone for the duration—by Government Order.

But the quality of each Plumb tool is the same. The expertly-shaped hickory handle, the one-piece steel head—tempered with exactness and skill. The hang. The perfect balance. For over eighty years master craftsmen have made Plumb tools—and zealously guarded these features.

Yes, appearance has changed slightly—but Plumb is proud of its service uniform. Fayette R. Plumb, Inc., 4837 James Street, Philadelphia, 37, Pa.

PLUMB TOOLS ILLUSTRATED, Top to Bottom: Wall Breaker; Roll Hatchet; Roll Pick Hammer; Single Bit Michigan Axe.

Quality Comes FIRST
PLUMB
is FIRST in Quality

PLUMB

HAMMERS • HATCHETS • AXES • SLEDGES

WILL SOLVE THE PROBLEMS OF TOMORROW

It is the young men of today — the students of industrial arts — who must face the problems which will arise before tomorrow's engineering marvels become reality. And tomorrow, as today, the ingenuity and reliability of "Yankee" Fine Mechanics' Tools will make them fitting helpers for these future craftsmen in their challenging task. "Yankee" Tools are designed for teaching . . . for saving time in the classroom as they do in the workshops and on the assembly lines of the nation. Teach with the tools that experienced craftsmen have used for nearly half a century. Remember, though, that war has first call.

No. 41 "YANKEE" AUTOMATIC DRILL
No. 2101 "YANKEE" RATCHET BRACE
No. 30A "YANKEE" SPIRAL RATCHET SCREW DRIVER
No. 2150 "YANKEE" BIT EXTENSION
No. 10 "YANKEE" RATCHET SCREW DRIVER
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No. 1545 "YANKEE" RATCHET HAND DRILL
No. 880 "YANKEE" VISE
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"YANKEE" TOOLS

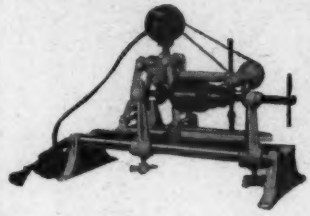
make good mechanics better

North Bros. Mfg. Co., Phila. 33, U. S. A.

Established 1880

WEIDENHOFF B&E SERVICE TOOLS

FOR BATTERY AND ELECTRICAL WORK

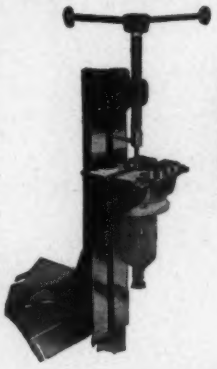


UNDERCUTTER

A heavy duty, precision mica undercutter. Undercuts commutators up to 6" diameter. Centers adjustable up to 18". Vee-blocks for centerless armatures. Motor universal-bronze sleeve bearings. Stroke regulated by adjustable stop. Sturdy steel horizontal support with machined keyway assures alignment and parallel movement. A practical tool in every shop.

GROWLER

Balanced ratio of wire and steel maintained to prevent over-heating and reduce current consumption. Meter indicates a defective armature winding, nature of defect and its exact location in armature, type of winding and pitch of coils. Field coils also tested by meter. Two switch positions — one for testing generator armatures, another for testing starting motor and generator armatures.



PULLER PRESS

A quick-acting arbor and puller press. Used for removing and replacing bearings, bushings, races, slip rings and caps, Bendix drives and gear. Saves time and labor and prevents breakage. Puller Plate has suitable openings for every job, including the small magneto bearing races. Maximum distance from drift pin to plate, 16½". Don't rely on makeshift methods when you can get this tool which meets all requirements.

POLE PIECE SCREWDRIVER

For instantly removing or replacing the most stubborn generator or starting motor pole piece screw without damaging parts. Pole pieces are easily pulled into position by the tremendous torque applied at the screw head. This combination tool is needed in every shop working on generators and starting motors.

Additional equipment in the B & E line which will prove useful in the school shop includes battery cell testers, contact point and brush tension scale, voltage regulator testing instruments, timing lights, compression gauges, fuel pump and engine vacuum testers.

KEEP BUYING BONDS

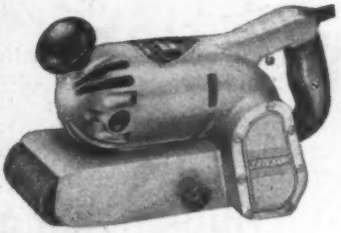
JOSEPH WEIDENHOFF, INC., CHICAGO 24, ILL., U. S. A.

Teach Your Students Better, Faster Sanding

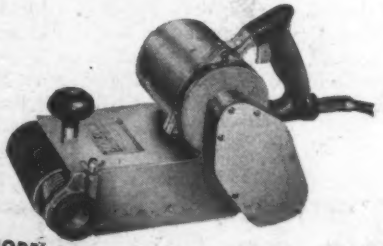
with the same SKILSAW BELT SANDERS used in Aircraft Production!

Photo from DURAMOLD Division of Fairchild Engine and Airplane Corporation

ZEPHYRPLANE
The modern, streamlined belt sander with 3-in. belt. Ideal for all sanding and final finishing. Powerful, ruggedly built for long, trouble-free service.



ZEPHYRPLANE, JR.
With 2¼-in. belt . . . outstanding lightweight belt sander for intermittent use in woodworking and cabinet making. Weighs only 9½ lbs.



MODEL "A"
With 4½-in. belt . . . a fast, powerful belt sander for toughest sanding and surfacing jobs. Also MODEL "B"—same size with vacuum dust collector.

You'll make better craftsmen out of students *quicker* if you teach them fine finishing work with SKILSAW BELT SANDERS . . . the sanders *preferred by industry* for power, speed and ease in handling.

In the aircraft industry, for instance, a prominent manufacturer found that ONE MAN using a SKILSAW BELT SANDER could do a better sanding job in ONE HOUR than TWO MEN formerly could in 3 to 4 HOURS!

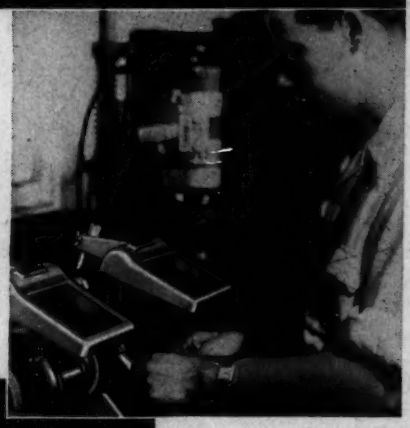
No wonder SKILSAW BELT SANDERS have such widespread acceptance! They're lighter, better balanced for easier handling . . . more powerful for faster work on the production line . . . or in your manual training shop. Ask your distributor for a demonstration at your school today!

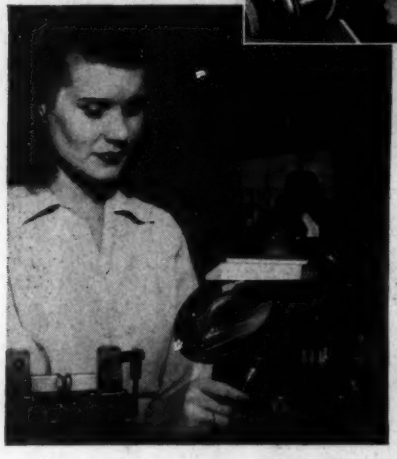
SKILSAW, INC.
5033-43 Elston Avenue, Chicago 30, Illinois
Sales and Service Branches in All Principal Cities

SKILSAW PORTABLE ELECTRIC TOOLS
MAKE AMERICA'S HANDS MORE PRODUCTIVE

To Practice What You Teach

Stanley "Flud-Lite" Eye Shields easily applied to bench or belt-driven grinders.





Stanley "Flud-Lite" Magnifiers available in bench and portable hand grip models.

STANLEY

"Flud-Lite" Eye Shields

The Importance of Eye Protection is demonstrated efficiently when your school shop grinders are equipped with Stanley "Flud-Lite" Eye Shields. The combination of safety glass and ample light on the work helps prevent injuries, improves work, saves tools. The Eye Shields are adjustable, but cannot be moved to non-guarding position.

"Flud-Lite" Magnifiers

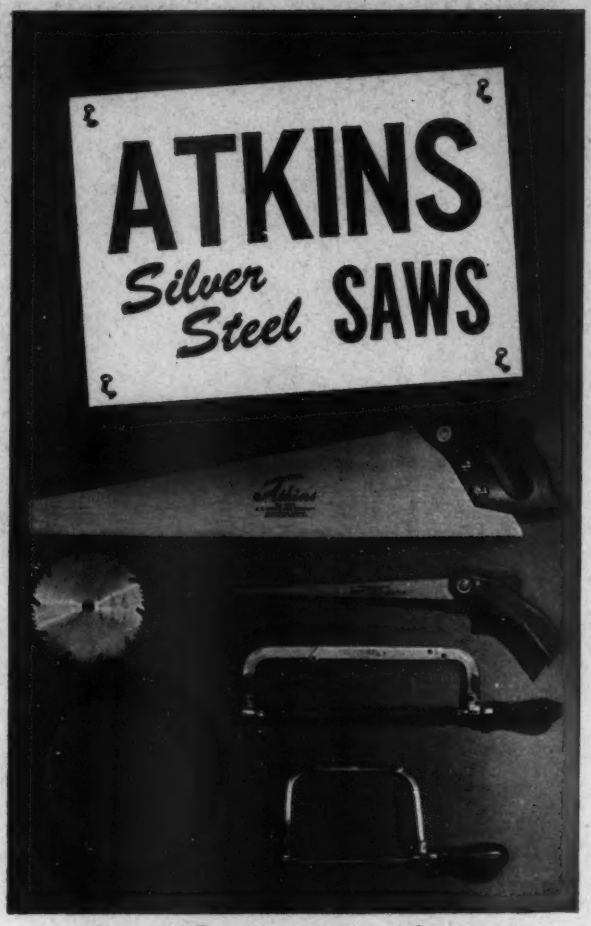
The Importance of Eye Efficiency is proved in a practical way through the use of Stanley "Flud-Lite" Magnifiers in the shop and other school departments—such as printing shop, physical and biological laboratory. The high quality 5" lens and fluorescent daylight lamp is a decided aid in examining machined parts for flaws, and for many other magnifying purposes.

Write for details. Educational Dept., Stanley Electric Tool Division, The Stanley Works, New Britain, Connecticut.

STANLEY

TRADE MARK

STANLEY ELECTRIC TOOLS



It's Easier to Learn

THE RIGHT WAY

with

THE RIGHT SAW

While every manual training room is likely to have saws of the right type for every kind of work, it's a good habit to make periodic checks of saws. Successful training, of course, depends a great deal on the student's access not only to right type of saw, but to *good* saws, whatever the type. In addition to those shown, the Atkins Silver Steel line includes numerous other types. Check over your saws now—and replace the inefficient ones with correctly designed, edge-holding Atkins Saws. Write for the Atkins Catalog of School Saws.

***Free*—Wall Chart on Saw Fitting**

A valuable aid to teaching saw maintenance. A 19" x 25" wall chart that illustrates in detail the right way of filing and setting saw teeth. Free copy on request.

E. C. ATKINS AND COMPANY

404 S. Illinois St., Indianapolis 9, Indiana

Agents or Dealers in All Principal Cities the World Over

Send for these Helpful Booklets

(no charge of course!)

Send for these free booklets now. You'll find them both interesting and useful in your teaching work. With the booklets, we'll send a new, revised Douglas fir plywood chart—a handy guide in ordering plywood for specific class-room purposes when this versatile material is once again available.

★

Because of its many advantages, Douglas fir plywood today serves the war effort exclusively — in building boats, barracks, hutments, troop sleepers, shipping crates and hundreds of other essential items. But when these needs are no longer so urgent, you'll find that Douglas fir plywood will be one of your most useful teaching materials. It is ideal for class room use because it can be easily worked with any tools, is durable, light in weight, split-proof, puncture-proof. It gives students a finished job that is sturdier, more rigid, better-looking —resulting in a feeling of progress and accomplishment which is so necessary for successful teaching projects.

★

The Square and Its Uses

by M. M. Romig, Industrial Arts Dept., Washington High School, Portland, Oregon.

Designed to help the instructor stimulate the student, through a series of questions and answers concerning the Carpenter's Framing Square.

Minimalic Construction for Minimalic Men

by M. M. Romig.

A booklet explaining the place of miniature buliding in the training of boy builders.

How to Organize and Supervise Boy Builders' Clubs.

by M. M. Romig and O. G. Hughson.

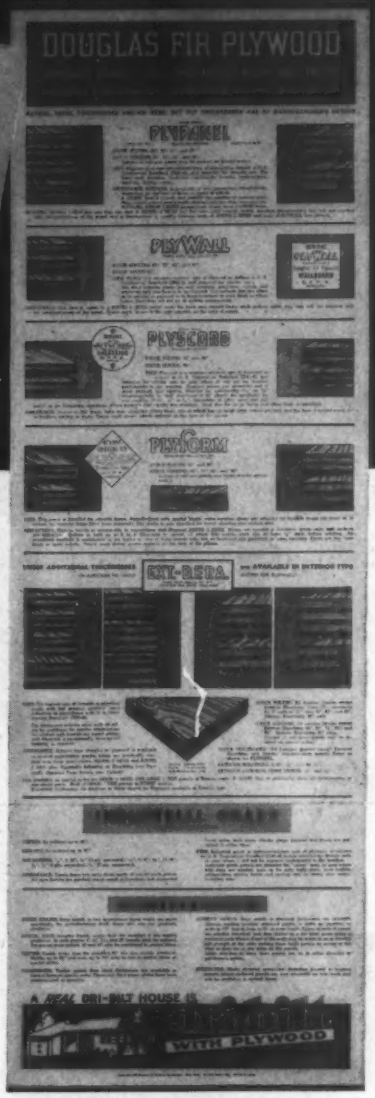
Written for the use of friends of building-minded boys, as an aid in organizing and conducting Boy Builders Clubs.

Movies

Write for pamphlet describing six, color and sound, movies available for class-room showing.

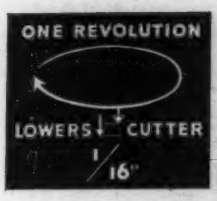
Douglas Fir Plywood Association

Tacoma 2, Washington



Also available without charge is this wall chart, showing grades, sizes and thicknesses of Douglas fir plywood—with brief outlines of the uses for each type and grade of plywood.

GENUINE DOUGLAS FIR PLYFORM Concrete Form Panel D.F.P.A. INSPECTED
GENUINE PLYWALL Douglas Fir Plywood WALLBOARD D.F.P.A. INSPECTED
SPECIFY DOUGLAS FIR PLYWOOD BY THESE "GRADE TRADE-MARKS"
PLYPANEL D.F.P.A.
EXT.-D.F.P.A.
GENUINE PLYSCORD SHEATHING D.F.P.A.



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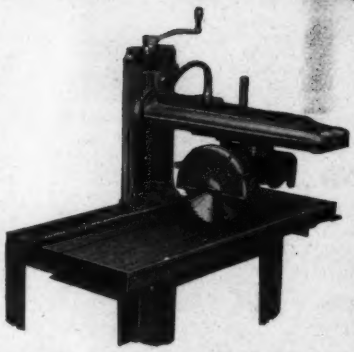

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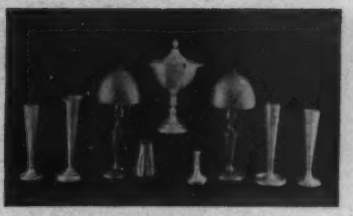

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INDUSTRIAL ARTS and VOCATIONAL EDUCATION

VOL. 33 SEPTEMBER, 1944 Number 7

Preparing for the School Opening

Vacation is about over and shop teachers are thinking about the opening of school. It is still time to plan for the first day's program. Experienced teachers know how important it is to have this initial teacher-pupil contact go off as smoothly as possible.

A definitely outlined program for the first session, therefore, is a necessity. For the shop teacher it is well to remember that many of his new students may never have worked with tools. They are eager to begin. Don't disappoint them by spending the entire first period in lengthy explanations. Let them handle those interesting tools if that is at all possible.

Attention also is called to the necessity of promptly notifying INDUSTRIAL ARTS AND VOCATIONAL EDUCATION of any change in address. Paper shortage makes it necessary to cut press runs to the bone. It is usually impossible to replace copies of the magazine that have been sent to an old address, but not returned to our circulation department.

When sending your new address, kindly remember to put in your zone number if you have one.

This Month's Cover

The American boys shown in the cover picture are far away from home. They are checking over the new motors that are to be installed in the plane shown. Their outdoor workshop is located somewhere in New Guinea. Photograph, courtesy of U. S. Signal Corps.

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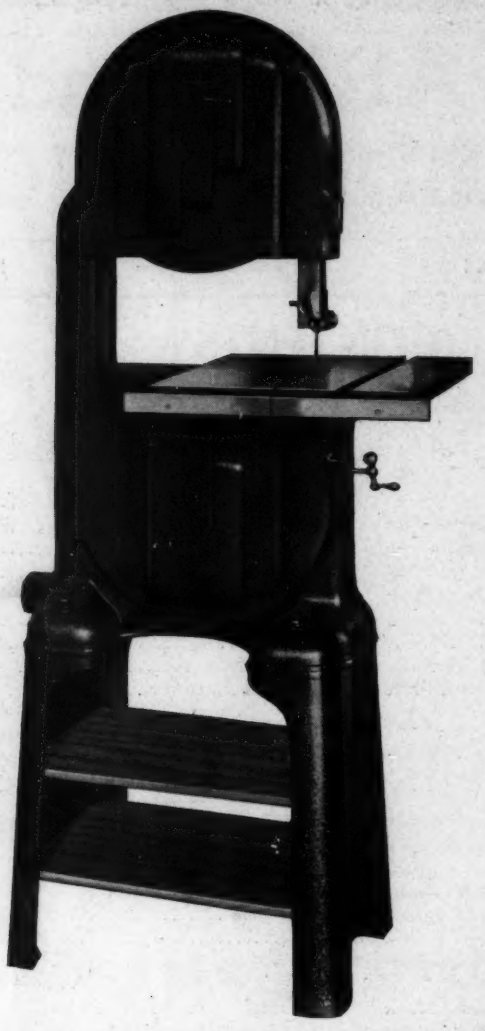

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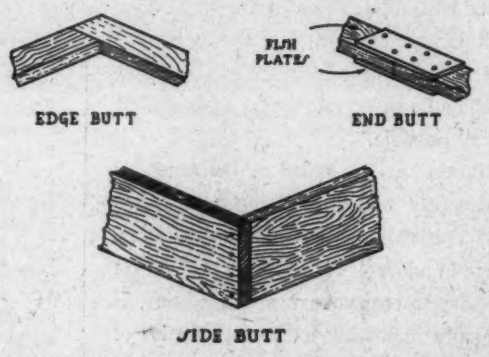
BAND SAW

No. 1 of a Series

JOINTS AND THEIR USES



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School-Shop Training Prepares Boys for Military Service

MAJOR RALPH C. WENRICH*

On August 28, 1942, Lieutenant General Brehon B. Somervell, Commanding General of the Army Service Forces, speaking before a group of leading educators at the National Institute on Education and the War, thus challenged schools of the nation: "We are engaged in a total war reaching into every phase of a nation's life. Total war is waged not only on the battle front, in the factory, and in the home, it is waged in every classroom throughout the nation. Every classroom is a citadel. Every teacher has his part to play. The job of the armed forces is to win this war on the battle front. The job of industry is to furnish the weapons and supplies needed by the armed forces to carry on total war. The job of the schools in this total war is to educate the nation's man power for war and for the peace that follows." It will be remembered that the summer of 1942 was a critical period in the history of our country. Our fighting men were suffering one defeat after another in an attempt to stem the enemy advances until we could build an army of sufficient size to recoup our losses and take the offensive. In speaking about the needs of the army, General Somervell further stated, "Shortages of trained man power — of men trained in the fundamentals of jobs that must be done in a modern army — are serious. The situation is not getting better. It is fast getting worse. The specialist field is being combed and recombed. The supply of trained men is dwindling by the day."

School administrators and teachers accepted this challenge, and immediately set about to make the necessary adjustments to provide young men soon to be inducted with the best background of education and training they could furnish. They taught young men the issues of the war and the nature of military life. They stepped up physical fitness programs. They gave prospective inductees needed skills in language communication and mathematics. They introduced new courses, such as radio code, driver education, army clerical procedures, and map reading. They encouraged boys to take advantage of available shop training facilities before reporting for military service.

*Chief, Pre-Induction Training Section, Military Training Division, Hdq. ASF, Washington, D. C.

Motor overhaul section of an Ordnance Company in New Guinea
— Photograph, courtesy of U. S. Signal Corps

School Shops Cooperate

Industrial-arts shops, vocational-industrial shops, war-production training shops, and shops used in connection with vocational agriculture programs all directed their major emphasis to the preparation of future soldiers. From an administrative point of view, this was not always an easy matter, since it often meant taking over school-shop facilities which were orginally intended for industrial arts on the lower grade levels, or in some cases using commercial shops in the community. Many high schools with inadequate shop facilities solved the problem by a cooperative arrangement with near-by vocational schools or war-production training shops. Others planned, in cooperation with industry, a work-study program enabling the student to learn on the job, add to his income, and aid in the war effort through production.

Several hundred thousand students are enrolled annually in high school industrial-arts courses which are providing basic knowledge and skill in the use of tools and materials. Many secondary schools, recognizing the value of such training as preparation for army occupations, are endeavoring to provide all boys with some type of shop work. This means that these schools are using industrial-arts facilities to maximum capacity.

The vocational schools of the nation have an annual enrollment of over a quarter million secondary school students in regular day school industrial courses, including auto mechanics, aviation, machine

shop, and communications. The same shop facilities are used for the training of over a third of a million men annually in part-time courses. Men who complete these courses are exceptionally well qualified for further postinduction training for one of the many military specialties.

The vocational agriculture departments have an annual enrollment of approximately 300,000 high school students. At least 80 per cent of this group receive instruction in farm shop activities which require 20 to 40 per cent of the time spent in the four-year course in vocational agriculture. There could be no better form of preinduction shop training than that received in a well-equipped farm shop in the hands of a capable instructor.

In addition to the preinduction training provided in the regularly established courses just described, the public schools of the nation have trained since July, 1940, over two and a half million persons in war-production pre-employment courses and nearly three and one half million in supplementary courses. During the past year alone approximately 15,000 high school students have received training in war-production classes. These classes, while primarily intended as preparation for and upgrading in industry, have provided valuable preinduction training to men who later were called to duty in the armed forces.

A study of war-production trainees by age groups indicates that approximately 75 per cent were of draft age at the completion of their training. This study also revealed the fact that three out of four pre-employment trainees were pursuing instruction which was directly applicable to military jobs and nearly half of the supplementary trainees were learning skills which could be used in military specialties. As a result of sample studies made during 1943 it was found that 13.3 per cent of former pre-employment trainees and 16.6 per cent of supplementary trainees were serving in the armed forces. In terms of numbers of men, this would indicate that approximately a million men in the armed forces on December 31, 1943, had the benefit of this type of vocational training as preparation for military service. It is reasonable to assume that since that time many more have been inducted, especially in view of the present Selective Service policy regarding occupational deferment.

The Rural War Training Program, including the OSY, OSYA, and Food Production War Training Programs have provided shop instruction valuable to the future soldier. Nearly a million and a half youth ranging from 14–24 years of age have benefited by instruction in operation, care, and repair of trucks; tractors and automobiles; metalwork; woodwork; electricity; and repair, operation, and construction of farm machinery.

Vocational schools, vocational departments, trade schools, and industrial-arts programs have made a contribution toward winning the war which cannot be estimated merely in terms of *numbers* trained. The *quality* of the training which has produced skilled workmen possessing desirable work habits has contributed immeasurably to a more efficient army.

Carburetor and ignition section of the Ordnance Company in New Guinea
— Photograph, courtesy of U. S. Signal Corps

Training Proves Helpful to Army and Inductees

Mechanical skills and related knowledge acquired before induction into the army result in the mutual gain of the inductee and the service to which he reports. Let us consider how the inductee benefits.

The army inductee is going into an organization made up of men performing several hundred different types of work, most of them requiring a certain degree of mechanical skill. Obviously, the young man who has aptitude for this work and some training or experience has a better chance to succeed in his military assignment.

In response to the question, "What courses have proved most helpful to you?" one Army Air Force soldier writes, "The Air Corps is a purely mechanical minded organization, as we all know. Electricity, gas, engines, turbines, structural compensations, and the like begin to clog and clutter up a mind that has been dealing with Edgar Allan Poe or the art of public speaking. Most of us lacked the knowledge that a shop course on engines could give us." Another soldier, in answer to the same question, writes, "I've been handicapped (that is as far as the army is concerned) by not having had more of the *right* kinds of courses. I should have taken my physical education more seriously than most high school students are wont to do. Secondly, I had too much of the bookish scholarship. It was not properly balanced with training in manual dexterity (industrial arts, typing, etc.). Finally, more *applied* mathematics and physics and chemistry would have been an asset in the army."

In a survey of men who had received training in war-production training courses, a soldier who had taken aircraft welding reported, "I would never have been able to enter the branch of work in the Air Corps that I have entered without the training I received." Such expressions as these have come from soldiers who took War-production courses in radio: "The training was excellent — because of it I have been assigned to study radio in the army"; "The schooling I received helped me very much with the many duties in the Signal Corps of the army — thank you." A former war-production trainee in auto mechanics said, "What they require us to do here at the Motor Pool where I am working is to use the proper tool. It wasn't strange for me; I already knew it; I learned from you."

Job of the Schools Not Yet Completed

The optimistic news received from every battle front — France, Russia, Italy, and the Pacific inclines some of us to relax

Radio repairmen checking defective sets

— Photograph, courtesy of U. S. Signal Corps

our war efforts in anticipation of an early victory.

Such optimism is dangerous. The war is not yet over. Examine your current war maps to see how far our troops have yet to go before reaching the prewar soil of our enemies. Study the statistics which show the military strength and physical resources of our enemies. Consider our mounting casualty lists. Observe the reports of military authorities who have recently returned from battle fronts. Robert A. Lovett, Assistant Secretary of War for Air, after several weeks in England and Normandy, has said, "There is nothing in the record to support the amazing wave of reasonless optimism in this country. I am convinced the war will be a darn sight longer than anyone back home thinks, with the exception of informed army officers."

No, the war is not yet won, and so long as the war continues we shall need trained men to replace those who for one reason or another are lost to the armed forces.

Based on present estimates, the monthly replacement requirements for the armed forces are approximately 70,000 for the army and 10,000 for the navy. Approximately 100,000 boys become 18 years of age each month. It is estimated that approximately 60,000 of the group for any given month can qualify physically for general military service. Most of these physically qualified men who will fill replacement quotas are either now in high school or have graduated. Therefore, every physically fit boy in high school approaching the age of 18 is a potential soldier. *The need for preinduction training will continue so long as the army continues to induct men.*

Some may ask the question, "What do boys coming into the army need in the way of high school preparation?"

1. The rigors of army training and combat duty demand that the soldier have good health and rugged physique. He must possess above average muscular strength, endurance, agility, and co-ordination.

2. All soldiers must have certain minimum equipment in mathematics. They must be able to compute with ease and accuracy and they must have sufficient insight into basic mathematical principles to be able to analyze and solve problems in practical situations.

3. Since language is the chief means of communication, soldiers must possess basic skills including listening, reading, speaking, and writing. Exact, simple communication is essential in warfare.

4. Every soldier should understand the reasons why we fight. The man who realizes that this is his fight serves more wholeheartedly and intelligently than the man who merely gives unreasoning obedience.

5. Every prospective soldier should understand the nature of military life. Many young men at the time of induction undergo a needless great emotional strain because they do not know what they face. Advanced knowledge about the army and the life of a soldier can help them in adjusting readily to army life.

6. Every soldier should be able to read and understand military maps and map substitutes, including overlays and rough sketches. If a soldier is detached from his unit, he should be able to determine his approximate position on the ground in relation to the area in general, and in relation to his base of operations.

7. This is a mechanized war. In addition to being fighting men, soldiers must be able to work with the complex machinery used in modern warfare. To do this, they need a functional understanding of scientific principles. Each soldier who enters the army should be equipped with a scientific background sufficient to enable him to grasp with ease the technical training that may be given him. This need can be met by academic high schools as well as vocational schools through more practical laboratory work in physics and other science courses. Schools should emphasize the areas of functional scientific understanding that are fundamental to many army job families, such as electricity, machines, radio, and automotive mechanics.

8. Every inductee should possess skills related to some occupation useful to the army. Soldiers must operate, maintain, and repair all the varied and complex equipment of war. To do this requires men with occupational abilities, especially in the fields of auto and aircraft mechanics, machine shop, and electrical signal communication.

Lt. General Brehon Somervell, in addressing school people, recently stated, "Preinduction training and postinduction training are part of the same essential process. You are concerned with the whole boy. We are concerned with the whole soldier. They are one and the same person. The future soldier has vital needs which must be met prior to his induction. Job skills, physical fitness, sound basic education, and above all, the will to fight. These are common needs to all soldiers. Schoolmen and military men share a common purpose and common problems. We are all teachers. We are all determined to achieve the same goal. We are all dealing in terms of humanity. In our hands rests the responsibility for the generation that will free the world. There can be no more important job than this."

The needs of the prospective inductee mentioned in this article are determined by the Pre-Induction Training Section, a Unit of the Office of Director, Military Training, Headquarters, Army Service Forces, which analyzes army training manuals and training procedures, questions officers responsible for training, and studies soldier opinions. Out of the data collected, it defines needs which schools can help meet and interprets these needs to those responsible for civilian education. The following bulletins,** outlining these needs for preinduction training, were prepared jointly by the U. S. Office of Education and the War Department, and are available through the officer in each service command headquarters who is re-

**These materials are also available from the Superintendent of Documents, Washington, D. C., at 10 cents per copy.

sponsible for the preinduction training activities in that area.

PIT 101 Fundamentals of Electricity
PIT 102 Fundamentals of Machines
PIT 103 Fundamentals of Shop Work
PIT 201 Fundamentals of Radio
PIT 202 Fundamentals of Automotive Mechanics
PIT 330 Pre-Induction Training in Vocational Schools, Vocational Departments, and Trade Schools
PIT 331 Pre-Induction Vocational Training in Auto Mechanics
PIT 332 Pre-Induction Vocational Training in Machine Shop Practice
PIT 333 Pre-Induction Vocational Training in Aircraft Maintenance
PIT 334 Pre-Induction Vocational Training in Electrical Signal Communication
PIT 401 Fundamentals of Military Map Reading

The Red Cross and the School Shop

JANET C. BOYTE*

When the Los Angeles blood donor center, confronted with shortages of labor and material, needed 850 shipping cases for blood plasma within four weeks, Junior Red Cross members in the workshops of John Adams Junior High School and Washington High School pitched in to fill the order. Under the direction of Harry Black, their instructor, the Adams School boys alone turned out 650 of the specially designed cases before the deadline.

This is typical of the service which American Junior Red Cross members in industrial-arts classes throughout the nation are rendering their country. The Junior Red Cross, with 18,000,000 members in the schools, fosters many service activities, but at present, production for the armed forces — in industrial arts, home economics, art, and other classes — has priority on the program. Members have provided some 25,000,000 items to servicemen in camps and hospitals in America and overseas since Pearl Harbor, and shop classes deserve credit for a large proportion of these articles.

Pupils make checkerboards, ping-pong tables, ash trays, bedside tables, lapboards, canes, and countless other items to meet

*Assistant to the National Director, American Red Cross, National Headquarters, Washington, D. C.

Convalescent serviceman using a solitaire board made at the Oak Park-River Forest High School, Oak Park, Ill.

Junior Red Cross members making game boards for servicemen — St. Louis, Mo.

Working for the servicemen. Oklahoma School for the Blind, Muskogee, Okla.

Making book racks for hospitalized servicemen — Stivers High School, Dayton, Ohio

specific requests of camp and hospital councils and Red Cross area offices. Working through these channels, imaginative teachers are demonstrating how shop skills and techniques can be taught through projects which give pupils a sense of vital participation in the war effort. Pupils not only acquire the essential skills but feel that they are making a direct contribution in service, even though they are too young to be in uniform.

Junior Red Cross projects frequently correlate many departments in the school curriculum. Howard L. Stannard, of Edison Vocational and Technical High School, Mount Vernon, N. Y., drew upon such subjects as English, social science, occupational information, transportation, lumber and its utilization, industrial chemistry, mechanical drawing, and mathematics when his class constructed an occupational therapy table for use in a veterans' hospital. In developing the project, pupils wrote letters to business firms to request cost estimates and to accept bids, figured costs, handled publicity, prepared working drawings, and in numerous ways used various subjects which they were studying.

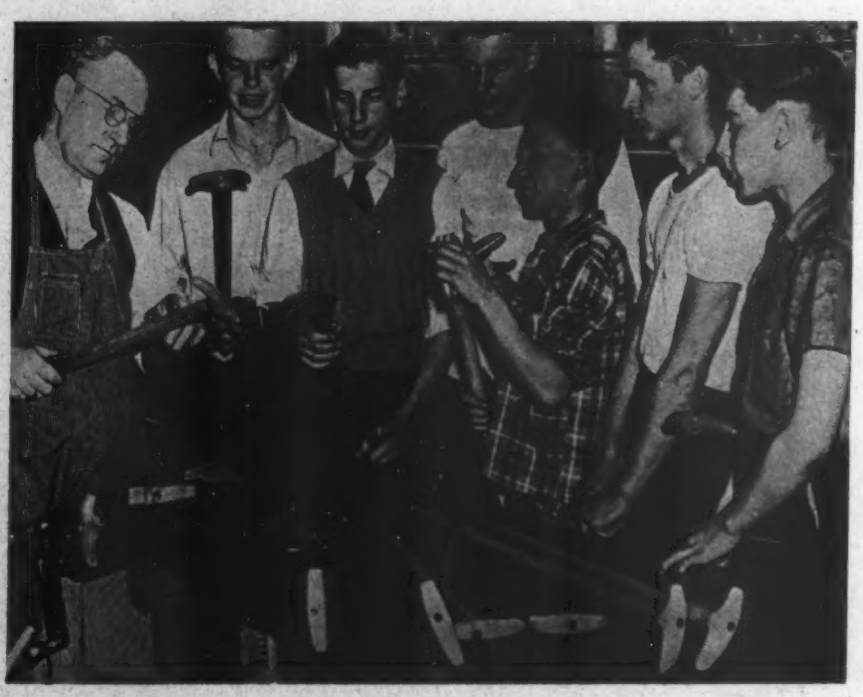
In many cases, pupils themselves have worked out improved designs for items which they make upon request. Students at Oak Park-River Forest Township High School, Oak Park, Ill., and their instructor, R. D. Paxton, perfected the design for a solitaire board which holds cards in place for men lying in bed. It now is the copyrighted and accepted pattern issued by American Red Cross headquarters. Bridgeport, Conn., industrial-arts shops were asked to make washing trays for hospital trains transporting disabled servicemen. With their instructor, Ernest Ryder, the boys in the Bridgeport schools developed an improved model highly acceptable to the military authorities. The trays, which hook onto the edge of bunks, hold soap, a washbowl, and toothbrush tumbler.

Student ingenuity manifests itself in many ways. In cooperation with art and sewing students, industrial-arts students of Shaw High School in East Cleveland, Ohio, produced a collapsible, portable diorama for the Red Cross Blood Donor Service, showing a blood donor room with doll figures. Both the operating table and the miniature light work realistically, and the finished diorama is used for display purposes to recruit donors.

Many classes make furniture or recondition secondhand furniture for company dayrooms. For example, boys in the industrial-arts classes of Wichita High School, Kans., in two semesters completed 587 writing tables and bookcases for dayrooms and barracks at near-by posts. And for five station hospitals in the Middle West, Lane Technical High School students in Chicago under the direction of Charles Peterson, industrial-arts instructor, turned out 500 bedside tables, a tricky and intricate assignment.

One of the most skillful transformations ever effected by Junior Red Cross craftsmen was the conversion of a trailer chassis into a mobile canteen for the Kansas City and Jackson County Red Cross Chapter, Missouri. Pupils of the Manual and Vocational School laid a floor, built shelves, and installed a twin basin sink with burner to be used either as steam table or sink. They fitted the canteen with electric refrigeration provided by storage batteries, and with two 10-gallon coffee urns, and covered it with a double canvas top which extended to provide a 15 by 24-foot shelter. The resulting canteen accommodated 12 workers and was capable of feeding 1500 persons.

Repeatedly, those in a position to be



Canes for servicemen — Garfield Junior High School, Johnstown, Pa.

critical have commended the excellence of student production. The commanding officer of the hospital at Camp Framingham, Mass., wrote as follows to the Boston Metropolitan Chapter: "During an inspection tour of the hospital last week General Blood commented on the back rests and bed trays made by Junior Red Cross members. We find that they are much more substantial and better working than anything we have seen. Without them the patients must either read, write, and eat lying down or else sitting up without any support for their backs. In spite of the hard use we have given these back rests, every one of them has stood up perfectly. They are built like tanks."

Junior Red Cross production items sometimes find their way to American servicemen in far corners of the world. Each hospital ship to be commissioned receives a quota of lapboards made by industrial-arts students. Recently industrial-arts classes have been asked to step up their production of canes for convalescent servicemen. Game boards are always in demand. Cribbage boards, given to soldiers in an evacuation hospital during the early days of the Italian campaign, were greeted with enthusiasm which is a real reward to the makers, as indicated in the following letter from a recreation worker on a hospital ship:

"I well remember one day when our ship was in Salerno Bay and a Red Cross worker from one of the evacuation hospitals came out in a 'duck' and asked us for games. All her supplies had been 'lost,' and we gave her what we could spare, including a dozen cribbage boards made by the Junior Red Cross. She literally pounced on these, as the men had been asking for them. When I saw her later she told me the boards had created a big sensation and were all distributed in a few minutes. Similar cribbage boards accompanied us on our trips in the Mediterranean and across the Atlantic and were enjoyed by hundreds of patients. I wish the young people who made them could have seen the expressions on some of the patients' faces whenever the games were distributed, and later have watched the men playing in groups — their tenseness from their recent battle experiences fading as they became engrossed in some simple, effortless form of recreation."

Making boxes for blood bank — John Adams Junior High School, Los Angeles, Calif.

Vocational Education in a Navy School

DONALD K. BECKLEY*

It seems evident that the widespread educational programs of the armed forces will have far-reaching effects on postwar civilian education, especially in the vocational areas. While it is not yet possible to foresee precisely what changes will result, helpful comparisons can in some cases be made now between armed forces schools and civilian institutions. This article has been written to describe how one of these war-training schools operates, and to contrast the daily routines of the students and instructors with those of civilian schools and colleges.

The first ground school work in the rigorous aviation training which leads to a commission as a navy flier is given at a United States Naval Flight Preparatory School. One of these schools is located at Monmouth College in Monmouth, Ill., where the writer has been a civilian instructor since shortly after the inception of this school early in 1943. The training here extends over a period of 11 weeks, after which cadets who have completed the work successfully move on to another base where they begin to learn flying. At this school reveille is at 5:45 a.m. and classes begin at 7:30. Except for one and one half hours of physical training, the cadet's day is spent in classes: seven hours of them, six days each week. The subjects covered include navigation, mathematics, aircraft engines, theory of flight, aerology, code, and aircraft recognition, most of them taught by civilian instructors. With time out for lunch at noon and a ten-minute break between periods, classes continue until 5:00 or 5:30. Two hours each evening from Monday through Friday

Cadets marching to class

*On leave from Rochester Athenaeum and Mechanics Institute, Rochester, N. Y.

A scene in the mess hall, formerly college dining room
— Official U. S. Navy Photograph

are set aside for study or review classes, which leaves but little free time before taps at 9:45 p.m.

Grades are assigned on the basis of weekly tests. Most of these tests are prepared by the navy rather than by the individual instructors, and are commonly of the multiple-choice type. The customary navy grading scale of 0 to 4.0 is used, with 2.5 as the passing grade. A strong incentive to keep up in one's work is provided by a system of restrictions. If two-course averages for the previous week are not passing, or if the same subject has been failed two consecutive weeks, the cadets concerned are required to report to a study hall Saturday evening and most of Sunday, and thus have virtually no time for recreation during the entire week. Restricted week ends result also from disciplinary reasons, and there is a long list of offenses which can result in demerits and restrictions in various grades of severity. Those cadets who fail, or "wash out" of the course are sent to the Great Lakes Naval Training Station for assignment as enlisted naval personnel. A cadet is sent to Great Lakes only after a period of probation and a careful study of his individual case by an advisory board of officers.

It is, of course, difficult for cadets who have not previously studied under an intensified program to accustom themselves to the speed with which they are expected to assimilate the new material. Those who have been out of school for several years find it especially difficult to become students on such an accelerated basis. While improved methods of teaching have made more rapid progress possible in some armed forces training programs — the teaching of languages is an outstanding example — similar improvements have by no means been developed in all fields of war training. In the courses here the traditional teaching devices of lecture, question and answer are still used — the principal difference is that the material is covered more rapidly. A number of the courses have textbooks prepared by or under the direction of the navy, which include all of the material the cadet is expected to know. The instructor goes over this material in class, chapter by chapter, answering questions, giving out review outlines and tests, and using whatever visual aids have been provided. These aids include sound motion pictures and slides for several of the courses, and numerous demonstration models. Personal contact with cadets is limited, and classes are more formal than in civilian schools where more leisurely programs make friendly contacts between faculty and students possible.

The cadet's biggest problem seems to be that of retaining the material taught. On some Saturdays he has seven hours of tests covering material studied during the week. The period provided in most schools during which a student can assimilate material learned is not possible under an intensified program such as this, and cadets may become hopelessly confused on a test or forget information they understood adequately the previous day. Constant repetition is the principal device used in teaching this material.

The school itself is under the command of a naval officer who has a staff of officers under his direction. The necessary clerical work is performed by enlisted navy men and by civilians. The civilian instructors are employed by the college at which the school is located, and their schedules are prepared and duties assigned by one of the regular members of the college faculty who acts as co-ordinator between the college and navy school.

A normal teaching schedule here is considerably longer than in a civilian college, and comprises four or five class hours per day, or from 24 to 30 hours per week. There is the usual time needed for grading papers and computing grades. In addition, instructors often teach review sessions and proctor make-up examinations in the evenings.

One of the implications of a training program such as this is that a rigid discipline and an immediate incentive are needed if students are to work successfully under an intensified program. Far more than merely speeding up a course is necessary if the work is to prove effective, and any civilian attempts to introduce intensified training must take this fact into consideration.

The Postwar Three R's

EARL M. BOWLER*

Those who read the reams of material prepared for a "ready rolled" postwar era are impressed by the mealy mouthed attitude which prevails in two important phases of the problem. First, while much of the planning is for the future, the postwar period is already upon us. This is evidenced by such happenings as the discharge of a couple of million men, the recording of hundreds of thousands of casualties, the reconversion of industries in certain areas, and the establishment of demonstration centers for veterans' placement. Second, while planning has progressed on a grandiose scale, no one has pulled the best of all plans together into a well-integrated, workable program.

Until very recently much emphasis in planning was for the "educational rehabilitation" of the ex-servicemen. Newspapers and magazine writers suffered a long stroke of "college-itus" for the returning veteran, but gradually the swing went in the direction of things more practical.

The utilitarian value of a college degree is not on trial here; however, writers had better take stock of the desires of those concerned with making a living in the postwar world of today. The percentage of returning servicemen who will enter college for a four-year "stretch" will not exceed the percentage of the general population that presently graduates from four years of college.

One editorial writer on a metropolitan daily[1] some time ago stated the facts clearly when he wrote:

"Most partially disabled veterans will

*Dallas, Tex.

[1]Editorial, "Training for Veterans," *The Dallas Morning News*, March 12, 1944.

prefer vocational training to continued pensions, and in the end this policy may prove the more economical to taxpayers. Anyone with a spark of independence and initiative would rather earn his own living than to live on a dole from Washington. The program for veterans' training will enable many to enter occupations that seemed beyond their reach before the war. Even those who have dependents will be enabled to take advantage of this training.

"Use of blood plasma and new drugs is saving the lives of many soldiers who otherwise would die in battle, but this means that more men will come home with physical disabilities. For several decades the rehabilitation of wounded veterans will be a large item in the federal budget. While care will be needed to weed out chiselers, there should be no stint of funds needed to restore the wounded men to health and to prepare them to earn their living again in civilian occupations."

Such down-to-earth thinking should give vocational educators the feeling that out of the maze of postwar planning there has emerged a trend toward making discharged "GI Joe" vocationally competent. As plans pass from the liquid to the solid state, there begins to show up in the "jell" the value of giving further consideration to the postwar three "R's" of vocational education.

In McGuffey's day reading, 'riting, and 'rithmetic were the three "R's" of importance; in our day, *rehabilitation, retraining,* and *realignment* will be the three "R's" of importance.

Rehabilitation[2] is a multiphased program involving restoration, guidance, training, and placement. The Veterans Administration has been designated as the agency to handle service-connected cases. The Federal Rehabilitation Service, a branch of the Federal Security Agency, has not yet been undercut by other agencies in the service it can render nonservice connected veterans and civilian handicapped.

A discussion of the relative merits of each agency is of less importance than the quality of the job each should do. Placement is "proof of the pudding" in any training venture. Before placements can be made, training must be done. Before training for postwar employment is started, someone should determine whether workers can be placed in big industries where single-skilled operators are wanted, or whether the one-man business on main street is going to absorb the returning soldier and warworker.

The one-man shop has been the best source of placement for handicaps in years past;[3] it is expected to be equally fertile in the years ahead. Training for the small shop means training in all-round skills. Coupled with this should be courses in bookkeeping, human relations, marketing, and a gamut of other equally important *adjustment* subjects.

The Chamber of Commerce trend, toward getting large concerns to do for themselves those things that government regulation will make them do eventually, applies in the case of accepting a proportionate share of returning handicapped persons. Either industry will come forward with a plan to absorb its share of war casualties or legislation will make such a step mandatory. Long before "X Day," big business should have stated a willingness to place in the ranks a force of employees recovered from the pool of rehabilitated ex-servicemen. The ratio of handicaps in such plants should equal the ratio of handicapped to the general population, and, what is more, these workers should be in addition to those returning to jobs formerly held with the plant. Attempts by management to "get by" with a smaller percentage will surely bring about less generous state and federal legislation.

Vying with ex-servicemen for jobs will be the victims of war-connected production. Unit skilled workers, aged men, uninitiated women, and unthinking youngsters, nearing 63 million in all, are rolling up an all-time high in industrial accidents. Count many of these people into the rehabilitation job at hand.

Count a significant portion of these folks into the retraining job as conversion to a peacetime economy gains momentum. A surprising number of women will want to remain in the earning class after the war. Such surveys as have been made to date indicate the more determined among this group are those who feel the day of romance for them has passed.

If, as has been predicted by some, 15 per cent of present facilities will produce enough airplanes to satisfy peacetime demands, the greater part of a major wartime industry will stand idle after the war. Prior to a demand for aircraft will come the reconversion to prewar production to satisfy well-established consumer demands. Later will come an adjustment to the postwar economy. Made government work will again fill this gap, and in this grand "pussy wants a corner" scramble, women will want for a post.

Retraining, therefore, will be for tested and proved unit skilled men workers, including a host of discharged military people who will have to be readjusted to the competition of private industry. Employers may be expected, if the labor market is sufficiently tight, to actually encourage the higher type unit-skilled workers to get into retraining classes. Because of the splendid job our public vocational schools have done,[4] they may be expected to do the training job for the reconversion of industry to peacetime activity.

Licensing as a means of control can be expected to become more popular in the postwar period. Airplane piloting and servicing, radio operation and control, and other services requiring definite "standards" of performance will, in greater numbers, turn to the vocational schools for preparatory courses. The exacting demands of some of these occupations will open up the whole field of training that might well be labeled semitechnical.

Hundreds of military officers expect to go directly into industry from the technical positions they now hold in the service. Because of the all-round skills required by all but the biggest of industries, many of these boys will meet with disappointment at the front gate. A wise army technical man will plan now to enter a vocational training course in his local community or at the near-by area school when "X Day" comes. The key to a job in the civilian economy will be through the training and placement facilities of the vocational schools. It is expected that the desire for a college degree will prompt a few to get on the campus where the curriculum is greatly enriched with cultural values.

Realigning the curriculum to better meet the needs of 16- to 20-year-old groups is an important postwar undertaking. It is important because we have delayed overlong meeting this issue squarely. Terminal college courses combined with typical vocational shop training will better meet the needs of the great group of 16 to 20 year olds who will find jobs impossible to get in an already crowded postwar labor market. Capable young people should be encouraged to complete college courses undertaken; those best suited to enter the less exacting occupations should be helped to a start in this direction. At the end of two years of higher education, a youth should be prepared to enter a work-a-day world with some skills to sell an employer, or if through demonstration he has proved to have sufficient capacity and steadfastness of purpose to profit by a college degree, he should be persuaded to continue in this direction.

While McGuffey isn't here to chide us about it, the three "R's" will play an important role in the postwar reconstruction, reconversion, and readjustment period.

SHAVINGS

Orville Hayford*

Have you ever watched a student
With a plane held in his hands?
How he makes those fancy shavings
'Round about the place he stands?
There's a certain fascination
In the thing it seems to me
And a parallel in life
I wonder if we ought to see.

We are daily making "shavings"
Of the plans we have in mind,
And when all is past and over
Shall we really only find
A mass of wasted effort
Or the shaping of a plan?
Shall we find this boy before us
Formed into a useful man?

*Washington Irving High School, Tarrytown, N. Y.

[2] "Coordination," Vol. 29, No. 6, June, 1940, INDUSTRIAL ARTS AND VOCATIONAL EDUCATION Magazine.

[3] "Main Street Held Key to Postwar Jobs," *Christian Science Monitor,* February 10, 1944.

[4] "The Schools Should Retrain Our Workers" by J. Frank Beaman, *Saturday Evening Post,* December 4, 1943.

Fig. 1. (Left) Marine Chief Warrant Officer George E. Hagen, Officer-in-Charge of the reproduction section at Camp Elliott, San Diego, Calif. Fig. 2. The drafting and artist section where the drawing and designing work is done
— Official Marine Corps Photographs

Area Reproduction Center

CAPT. ARTHUR A. ENGEL*

The Area Reproduction Section at Camp Elliott supplements the Marine Corps lithographic sections of the east coast with the preparation of additional pamphlets, manuals, maps, and other lithographed material.

The Area Reproduction Section was organized in December of 1943 to do the work which was formerly done by engineer units temporarily occupying Camp Elliott, and has proved itself extremely valuable in many cases on work not required of these units.

Occupying a vacant motor transport garage, the section has taken on a great many types of work not anticipated at the time of organization. The 12 men who originally built the photo darkroom and reproduction facilities have been since supplemented by 5 men and 2 women reserves. Chief Warrant Officer G. E. Hagen, USMC, has been in charge of the section since its inception.

The section is organized in three component parts: drafting, photolithography, and general photography. The largest of these parts, the photolithography, is subdivided into process camera, stripping, platemaking, and press department. Included in the press department is a small cutting and binding department.

*Public Relations Officer, U. S. Marine Corps, Camp Elliott, San Diego, Calif.

Fig. 3. (Left) Marines at work in the general photography section. Fig. 5. Getting the process camera ready
— Official Marine Corps Photographs

Fig. 4. The sensitizing material is poured on the whirling plate so that the centrifugal force spreads the liquid evenly all over the plate
— Official Marine Corps Photograph

The drafting section might well be called the art and drafting department. In addition to the ordinary drafting work required of a section of this sort, the department handles a great deal of creative work for covers of pamphlets and other work requiring cover design. Equipment is on hand in this department to handle tracings and make blue or black and white prints in continuous strips up to 44 in. wide.

From the drafting department, all work to be printed goes to the process camera room for coyping. The camera is large enough to take a negative 24 in. square, and work can be reduced 75 per cent of the original size or enlarged to twice its size. All types of work, line drawings, continuous tone photographs, or half tones can be copied.

The task of assembling the negatives in the proper order for printing falls to the stripping department. Pages are assembled, half tones inserted, and the work is masked preparatory to making the litho plates.

Work is exposed on the metal plates in the platemaking department by a photochemical process. After the plates are done they are sent to the pressroom for printing. Printing is done on one of two sized multilith presses, the larger of the two capable of handling a sheet of paper 18 by 20 in. in size.

In addition to the general photographic work in the area, the section takes all the public relations photographs for Camp Elliott, does the laboratory work for the leatherneck west coast unit, and also the laboratory work for the women reserve public relations office.

Of the staff of 17 men, 10 work in the photolithographic section, 4 in the drafting section, and 3 in the general photographic section. A majority of the men in the organization were trained in their line of work in civilian life.

Fig. 11. Reproduction work done on direct process paper
— Official Marine Corps Photograph

Fig. 8. Developing the plate that has been exposed in the printing frame. After the developer has been washed off with water, the plate is dried and is then ready for the press
— Official Marine Corps Photograph

"Administrators cannot be expected to help us much on the *hows* of our work, but they can and must understand and control the *whats* of our work in keeping with the *whys*. Aims and types of industrial education are squarely within the province of the administrator. — *Homer J. Smith.*

Fig. 6. (Left) After the film is dry the flat is prepared in such a manner so that it can be reproduced upon a plate by exposure to an arc-lamp. Fig. 7. Processing the flat
— Official Marine Corps Photographs

Fig. 9. (Left) The offset presses. Fig. 10. The embossograph sign-making machine

— Official Marine Corps Photographs

Training Aircraft Workers in Wichita, Kansas

CARL BRUNER*

Three days after the National Defense Training Act became law, one of the first schools in the country to come under its provisions was going full blast at Wichita, Kans. This apparent miracle of organizing genius was possible because for more than a year and a half there had been in operation in Wichita a program for the training of workers for the aircraft factories. This program was identical in most respects with the plan for training for essential industries provided in the National Defense Training Bill. In fact, it may safely be assumed that many important features of the National Defense Training Plan had their inception in the Wichita setup.

Mr. J. C. Woodin, supervisor of industrial education, working in close cooperation with Superintendent Mayberry, of the Wichita schools, with leaders in the community, with officials of the aircraft industries in Wichita, with a loyal corps of teachers, and with the State Board for Vocational Education, had foreseen the need of a training program for the aircraft factories about two and a half years before the defense activities stimulated the entire industry. Mr. Woodin and the aircraft factory officials felt sure that a superior type of factory employee could be recruited from the mechanized farming areas of Kansas. For example, 92 per cent of the population of Wichita is native-born American. If these boys were not found and trained, it would be necessary to attract men to the Wichita factories from the industrial areas in the East and on the West coast. If the average or superior factory workman could have been attracted to Wichita, the results would have been satisfactory, but it was feared that the good workman would, in all probability, be well pleased with his present situation, and Wichita would get more than its share of the floater type — the type that has no stake in any community. The factory executives and the Chamber of Commerce, along with Mr. Woodin, wanted sound people in the factories; men who could think for themselves.

After a series of conferences, a training program was established, running eight hours a day, five days a week, in the vocational education shops of Wichita High School East, starting June, 1939. All applicants were required first to be approved by the personnel office of one of the airplane plants, and then were put into the school for a two weeks' probation period. Incidentally, this screening process was the same as the setup later specified under the National Defense Training Program for Wichita, except that the applicant also must have been referred to the school by the Kansas Employment Service. An advisory committee consisting of equal representatives of the management and employee groups from the several aircraft plants was asked to maintain contact, offer suggestions, and to pass on important phases of the work. The teachers were practical men who had made good in the airplane factories; men who knew their jobs. Many of the regular teachers in the vocational department of the Wichita schools met this qualification and were used in the summer program. The courses offered were aircraft sheet metal, aircraft blueprint reading, aircraft machine shop practice, aircraft woodwork, and aircraft welding.

The venture was successful from the start. The factories found the men well trained, willing to work, and with a fine, loyal attitude toward each other and to the organization. Mr. Woodin made a flying trip to the various junior colleges in the state with the result that many of the students in the school have completed at least two years of college work before enrollment in the aircraft training course. The factory personnel offices liked this college experience as a background for the job training done in the school because they were thinking of the men as lead men in the future enlargement of the factory.

When the National Defense Training Program was established by act of Congress, it was a simple matter to make the

*Supervisor, War Production Training, Wichita, Kans.

An old armory transformed into aircraft training center

minor adjustments necessary to continue the school full blast. At the time of the transfer from Smith-Hughes to National Defense there were 279 men in training in the school shops in the city. Approximately 1500 men had been trained and placed in employment in the aircraft plants. Some enlargement in the services rendered took place immediately after the school became a part of the National Defense Program.

With the opening of the Wichita public schools early in September, defense classes were arranged on a two-shift basis. Regular day school occupied the shops until 3:30 p.m. The first shift of National Defense students worked from 4:00 p.m. until 11:00 p.m.; the second shift from 12:00 midnight until 7:30 a.m.

On January 22, 1941, the program was enlarged by the establishment of the National Defense Training School at 151 N. Waco. The building, temporarily vacated by the National Guard, was made available tax free and rent free to the board of education. Interested citizens raised $12,000, which was turned over to Mr. Woodin with no strings attached for the purchase of machinery and tools for use in this building. Later, a federal appropriation totaling close to $100,000 became available. Of this latter amount about $24,000 were used in the new school; the balance was utilized to supplement the training facilities in the shops at High School East and Central Intermediate. All three of these locations are now used for Defense Training classes. Additional appropriations for equipment have been made from time to time as the need became apparent until Wichita has one of the best equipped training plants in the Midwest. Aircraft woodwork, aircraft welding, and aircraft sheet metal were taught in the new school. Machine shop practice, sheet metal, and woodwork are taught from 4:00 p.m. until morning at High School East and machine shop practice at Central Intermediate. The shops at High School East and Central Intermediate are used for the regular day vocational classes during the regular school day.

Probably one reason for the fact that only minor changes were necessary when the school came under the National Defense setup was because the school was built upon the sound theories of vocational education that had been enunciated years before by such leaders in the vocational field as Dr. G. A. Prosser, C. P. "Skipper" Allen, J. C. Wright, and others. This adherence to a sound philosophy plus the inspiring leadership of Mr. Woodin and the wholehearted devotion of everyone connected with the enterprise to the idea, "Let's get the job done," made it possible to overcome the many obstacles that hampered the program at the start.

Great care was exercised in selecting the men to be trained. By having the prospective trainee first apply at the personnel office of an airplane factory and be interviewed by the man or men who would eventually hire him, only those suitable for employment were approved for training, and people unsuitable for employment were barred. Naturally, the standards used in selecting the people to be trained have been shifted from time to time to meet the shifts in the labor market.

The young men in the Wichita program spent all of their time doing the things that they would have to do after they were employed at the airplane factory. The old slogan, "learning by doing," was applied one hundred per cent. Activities such as assembly programs, athletic contests, dramatics, music, etc., were eliminated from the program entirely, not because they were not pleasant and worth while from a cultural standpoint, but because they did not contribute directly to the training that the boys had to have before they could be employed.

Each one of the Wichita instructors was selected primarily because he had made good on a job in an airplane factory. The experience available through these teachers covered a number of airplane factories in addition to the Wichita group so that discussions on factory methods and shop procedure took an additional significance. This was especially noticeable when the school at 151 N. Waco was established. Former Beech, Cessna, and Stearman men were brought back from Douglas, Lockheed, Spartan, Vultee, Curtis-Wright, and others. The wealth of information and the richness of the experience of the teaching group was highly satisfactory. The combined experience of the entire group found expression in a course of study that proved practical as a training aid and interesting to the students. The class organization was very flexible and entirely informal. Instruction was given to large groups, small groups, or individuals, as the nature of the fact or operation being taught demanded.

Planning the Wichita program

Training machinists and riveters

While the major contribution of the school has been the preproduction training given to factory workers, several other contributions to the aircraft industry have been made. Skillful workers from the plants have been employed by the school and trained as teachers. Their factory skill plus the training and experience gained in the training program made them eligible for supervisory positions in the factories. A considerable number of our teachers have left us to return to a much more responsible position in the factory than they had when they left to accept the teaching position.

Each individual member of the student group was permitted to progress as rapidly as his ability would permit, and promotions were made at any time on the basis of ability to do the work required. The enrolling setup of this school was very flexible as far as time of enrollment was concerned. Students came and students finished their courses and were placed in employment every day of the week. The men were trained for specific jobs, some requiring more training than others. The men came to the school from wide varieties of experience. Each received what he needed and was placed in employment. No individual was held back because of the lack of ability of some other member of the class. The board of education cooperated so well in supplying materials and equipment that few individuals were handicapped because of lack of these instructional aids.

It has frequently been said that "instruction and training should be based upon prevailing occupational standards." The instructors in the Wichita aircraft training program were *fresh from the factory*. Their daily contact, while in the factory, with what would pass military inspection and what would be rejected, had given them a set of standards difficult for them to have obtained any other way. The aircraft plants in Wichita are working on military contracts, and rigid military inspection is excellent training for any teacher of future factory workmen.

Work in this school first was set up as pre-employment or refresher training. Therefore, no effort was made to give the broad general background and familiarity with an industrial field that is frequently associated with a vocational training course; this was definitely job training. The men were being trained for highly specialized jobs, and every effort was made to give them sufficient training so that the break-in period at the factory would be very short.

Efficient provision was made for placement and follow up of all trainees who had been in the course for a reasonable period of time. Since the entire corps of instructors had been employed in the local factories, excellent personal contacts with the foremen of the several departments affected had already been established. Every teacher knew what the factory wanted and watched for the boy that had promise in that line of work, trained him to the factory standards of workmanship, and, through the personnel office, placed him on the job. As the program increased in size, much of this personal-teacher con-

Riveting and forming sheet metal

tact had to be replaced by a co-ordinator who spent enough time in the plants and the schoolrooms to accurately place the men on the proper job. This responsibility of placement was given to a representative of the Kansas Employment Service. Thus, the same agency screened the applicants before training and placed them after training was completed. Supplementary classes have been established, as provided in the Defense Training Act, to give the young workers who had been placed on the job an opportunity to broaden their trade knowledge and background. These courses require about ten hours per week, and are available during the day or in evening school.

The school supervisors work so closely with the instructors and visit the classes so frequently that neither the students nor the instructors feel that they are being scrutinized or subjected to an official checkup. By this system the improvement of instruction is a continuous process. Meetings of the teachers usually are conducted as a conference or discussion group rather than as a place for formal lectures. Bulletins are made available to the teachers on teaching techniques, course of study, organization, etc. With this setup efficient use is made of educational procedures, methods, and devices, with regard to (*a*) character of the teaching job, (*b*) characteristics of the instruction group, (*c*) the working conditions.

The training of women for work in the Wichita aircraft factories started in July, 1941, when the Cessna Company requested the school to train a group of girls selected by them, for certain definitely specified tasks in their factory. A committee, including lead men from the plant and men from the school, made a study of the proposed stations in the plant, identified the skills and information, and planned the course of instruction the girls should follow. Twenty-seven girls were enrolled for the work, three were dropped because of lack of ability, and the rest, with one exception, were employed by the company.

The Cessna Company builds a twin-motored advanced trainer with wooden wings and wooden control surfaces. Once skeptical woodshop foremen now report that there are few jobs that girls cannot do rapidly and up to the high standard of workmanship required for military equipment.

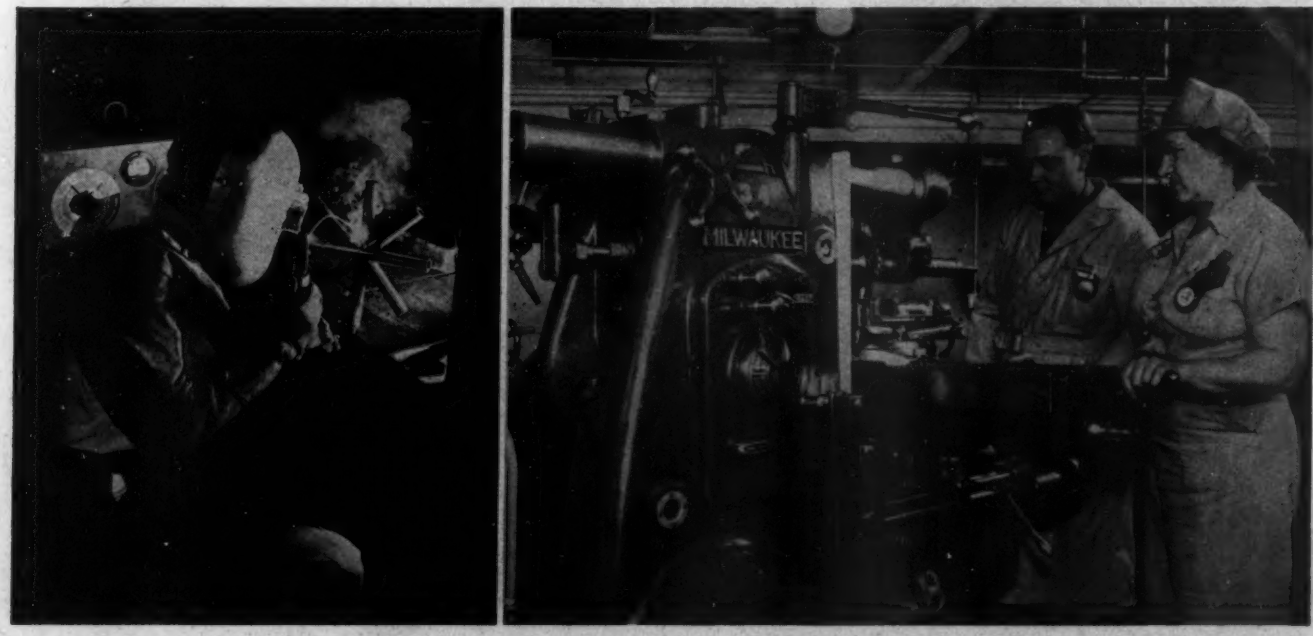
This pioneer woodwork class was followed by five other special classes to train girls to some exact specifications for the Boeing Company for work on their biplane trainer. Again the girls met production quotas with apparent ease. A class of girls was organized to learn to build parts for the Beech AT 10. These girls seem able to grasp the intricacies of scarf joints, and the flowing on of plywood skin, the use of Plascon glue, etc., as well as the male trainees.

Early in January, 1942, a request for the training of girls in aircraft sheet-metal work, with specific training in detail assembly and riveting, came through the advisory committee from the factory personnel offices. A large percentage of the enrollees showed a surprising aptitude for the work. Nearly all of the girls were delighted with the opportunity to "get into some defense activity," and seemed to mind not at all the soiled fingers, the noise, and bustle of the typical factory atmosphere that is duplicated in the school. The factories were so well pleased with the familiarity the girls developed with factory procedure, and the dexterity that they exhibited in tool manipulations, that they used the school as a source for feminine workers in many departments in addition to the sheet-metal stations for which they were specifically trained. Most of the girls in the school at present are in the sheet-metal division.

With the glider program that swept across the Wichita scene a few months ago came a request from the Beech Company for the training of women in aircraft gas welding. Training specifications stated that these girls should be able to pass the army test and become certified welders before they would be permitted to work on the structural parts of a military plane. The Beech Company planned to use these girl welders on bench welding operations making small parts and fittings. In a short time girls were being trained for all of the local plants. The demand for gas welders was such that before long, with the aid of Mr. Wargo of the Army Procurement Branch, the Army-Navy A certificate was broken down into four classifications, and hundreds of girls were trained and placed as C and D welders working on glider parts.

Our experience in the training of girls and women leaves little doubt in our minds that the replacing of young men urgently needed in the armed services by feminine employees is entirely sound and practical. Some jobs they should not be asked to do, but thousands of them will find the aircraft plant the place where they can do their bit for this war effort.

By November, 1942, it became evident that a sufficient number of trainees to take care of factory needs, who would voluntarily take training at their own expense, could not be found. The Boeing Company took the lead, but was soon followed by the other companies in the subsidizing of trainees. With this arrangement the worker is hired by the company and



Arc welding and machine-shop practice

sent to the school for specific training. Since November 18, 1942, when this arrangement was started, over 7000 trainees have passed through the school. The training facilities of the school are available to any local aircraft factory.

With the paying of the workers while in training came some added attention on the part of the factories to the development of types of training activity that would give even better preparation for the production job.

School and factory men, working together, studied the situations most frequently encountered when a worker was first assigned to production, and training activities were developed that would tend to overcome the difficulties. Jigs and fixtures were designed which gave practice in doing the job exactly as it was being done in the factory. The related information was checked carefully and new outlines were written.

Because of this close contact with the production problems as they developed in the plant, separate training programs requiring different lengths of time were developed for each factory. For example, the school staff in cooperation with the Beech Company developed a two-week schedule with little related work. Beech's needs were best met when a minimum amount of time was spent on assembly and the emphasis placed strongly on the driving of modified brazier (456) rivets. The Beech Company wanted riveting teams that had the speed, rhythm, and timing that their production schedule required — and they got them.

The outline as worked out for the Aero Parts Company occupied about four weeks and included flush riveting and a considerable amount of related technical information. Mrs. Eaton, Mr. Miller, and an active committee of foremen aided in the formation of the course, and then continued active interest guaranteed success.

The Cessna Company had their own particular problems as they changed from the production of a training plane of wood, fabric, and welded tube construction to the building of sheet-metal assemblies. To help take care of the problem it was necessary to set up conversion supplementary courses, preproduction training, and to assign some instructors to work with the new people on the actual production line in the Cessna plant. Cessna is getting the job done, and the school is doing its part.

The Boeing Company has experimented with various amounts of preproduction training. The training as it is being done at present puts much emphasis on flush riveting, both countersink and predimpled. Some wrench practice must also be taught since there is a strong trend to install most of the minor assemblies while the part is still in the sheet-metal area. This trend makes it highly desirable for each trainee to have some experience in the selection and proper use of the various types of wrenches and screw drivers used in the plant. Some familiarity with AN and BAC parts is an additional aim in this part of the course.

The school was first considered as a source of trained workers as the factories expanded. In some localities the training programs were closed as soon as the plants reached the peak in their employment curve.

In Wichita, however, the training program became so inseparably connected with the induction setup of workers into the several plants that it was continued as a source of trained replacement personnel. With an aircraft factory pay roll of over 60,000 workers, the training of replacements promises to keep the school busy for many months to come.

It has been said that an organization is but the lengthened shadow of one man or one group of men. The Defense Training Program in Wichita is undoubtedly a monument to Mr. Woodin's tireless efforts. Working with him and leaving an indelible imprint on the whole picture was Mr. Laurence Parker, state supervisor of the National Defense Training Program, and Mr. A. E. Schoettler, regional agent of the Office of Education in Washington. Through the years, Kansas has been fortunate in having as State Director of Vocational Education, C. M. Miller, who is always optimistically encouraging the whole program of vocational education in the state. These men offered invaluable assistance in the task of developing a school that would, at the same time, meet federal requirements and take adequate care of Wichita's needs. Both Mr. Schoettler and Mr. Parker have passed on to the men in the Wichita program the fruits of their wide experience in the field of vocational education. They visited the classes frequently, pointing out strengths and weaknesses that the men on the job were sometimes too close to their work to see. Many pitfalls were missed and many problems solved because of the friendly aid and constructive criticism of these two men.

The state office supplied the forms and set up the machinery for accounting for the financial and statistical side of the program. Reports are sent regularly to the state office, and compilations sent from there to the Office of Education in Washington.

Mr. J. C. Hoehle, superintendent of buildings and grounds for the Wichita public schools, and his staff of maintenance men have been most cooperative. In spite of a limited budget, they have found time and money to install many items of equipment and to do the thousand and one odd jobs of wiring, plumbing, repairing, etc.

The Wichita Defense Training Program for aircraft workers has become a mecca for schoolmen from a six-state area, who come to Wichita for ideas or just to see emergency vocational education in action. Newsmen, aviation officials, and just air-minded citizens form a constant stream past the visitor registration desk.

Superintendents, foremen, crew chiefs, and workers from Wichita's four airplane plants needed little encouragement to cause them to become regular visitors. These visits by men actually working on the job aided greatly in keeping instruction up to par, in keeping the school informed on latest techniques and devices, and promoted an opportunity for *hand picking* to some degree.

Men from all levels in the Wichita aircraft plants have worked very closely with the school authorities in the solution of training problems. Dr. Gooch, Mr. McCutcheon, Mr. McArthur, Russell Mosser, Guy Leet, Jim Isaacs, Norman Colvin, Ira

Making small parts and welding

Smith, Warren Blazier, Red Reever, Dave Reeves, Paul Hines, Reece Miller, John Dawson, Eldon Haynes, P. L. Hatfield, Betty Eaton, Bert Dawson, Forrest George, Dave Gambill, and many others have aided greatly in the development of the training program.

The Wichita Defense School has trained over 27,000 men who are now employed in the aircraft factories or have entered the armed services following employment in one of the aircraft plants. Over 1500 men in addition were trained and placed by the Division of Aircraft Training of the Wichita Public Schools before defense funds became available.

The federal government has seen fit to locate additional aircraft production facilities in this interior region. In an area within some 500-mile radius of Wichita are located the following aircraft production centers: Omaha, Kansas City, St. Louis, Tulsa, Dallas, Ft. Worth, and Oklahoma City. Many thousands of specially trained men have been needed to properly man these plants. The Wichita center, and others like it, have had an important part to play in this gigantic task.

The United States Employment Service has worked with the school and factories on many occasions. Mr. Charles Corsaut and his staff have given full friendly cooperation. There are few man-power problems that cannot be solved if the recruiting agency (the U.S.E.S.), the training agency (the Division of Aircraft Training), and the employing agency (the aircraft factories) work together and attack the problems in a spirit of friendly, constructive cooperation.

More recently the War Manpower Commission was organized and our old friend, Dr. Frank Neff, was made area director. Dr. Neff knows, from his wealth of past experience, the importance of training in the solution of man-power problems. We welcome his suggestions in his new capacity.

The American public is in unanimous agreement on the idea that "America must become strong, strong enough to resist any effort to modify our American way of life." The effort to capitalize on our human resources through training for national defense is certainly part of the picture. Perhaps it is our way to do our bit, in winning the ultimate victory.

The foregoing story concerns itself with the pre-employment and preproduction phases of the War Training Program in Wichita. Under Mr. Woodin's direction, and with the cooperation of the state and federal offices, an ambitious and effective supplementary training setup was developed. To Mr. E. L. Meader should go much of the credit for the development of this "upgrading" aspect of the training program. Mr. Meader worked actively with Mr. Woodin and the factory educational directors in the analysis of problems and the recruiting of students and instructors. In the enormous over-all training responsibility that is an inseparable part of the change from leisurely peacetime living to peak war production, a highly important part is the training given through supplementary classes to workers after they have been transferred to their production job.

How to Use the Blackboard*

CAPT. F. D. DOLAN**

Not long ago the newspapers carried a picture taken in the North African desert just prior to the campaign in which the British Eighth Army broke the power of the Afrika Korps and drove the retreating Germans into Tunis and Bizerte. It showed General Montgomery surrounded by a group of officers to whom he was explaining a detail of the plan of attack they were to follow. The General — right in the front lines — was using a large portable blackboard.

Next to his voice, the most flexible instrument of instruction available to an instructor is the blackboard. As a teaching aid it is practically indispensable. It must however be employed with a certain degree of skill or the results are likely to be disappointing. Fortunately, almost any instructor can learn to use the blackboard effectively. All that he has to do is devote a little time and thought to a consideration of the general principles which underlie good blackboard work and then use a little common sense in their everyday application.

Why do some instructors fail to use the blackboard more than they do? Why do so many persist in considering it to be no more than a feeble substitute for other visual aids? If you ask them they usually have one of three answers.

The first of these is, *"I can't draw."* There are two things wrong with this answer. First, it indicates a very narrow conception of what can be done with the blackboard because it implies that a blackboard should be used only for diagrams and drawings. In actual fact diagrams and drawings constitute only a part — and not always the major part — of a skilled instructor's blackboard work. Secondly, this answer is based on the erroneous belief that in order to do a good job with a blackboard the instructor must be something of an artist. Nothing could be further from the truth. Naturally a little artistic ability comes in handy, but there is plenty of hope for anyone who knows the difference between a straight line and a curve and who is willing to recognize the fact that the ability to handle a piece of chalk — like anything else — requires a bit of practice.

The second is, *"My handwriting is pretty bad."* — This doesn't stand up either. Once you get used to writing on a vertical surface it is actually easier to write legibly on a blackboard than on a sheet of paper. Anyhow, what's wrong with printing?

The third is, *"Blackboard work takes too much time."* Actually, the blackboard saves time by allowing the instructor to take full advantage of two very important laws of learning.

1. The most efficient of the five senses is the sense of sight.

2. The more sense channels employed by the student in any learning situation the more certain he is to get a correct picture of the thing being taught.

In addition, blackboard work helps the instructor place greater emphasis upon the important points of his lesson. Class discussion is more easily controlled. The instructor who hesitates to use the blackboard because he thinks it will slow him down just isn't aware of the immense difference between covering a subject and teaching it.

Advantages

As a visual aid the blackboard possesses certain advantages which explain its special value as a teaching device.

a) It is convenient. Some of an instructor's best ideas come to him right in the middle of a lesson. All he has to do is turn around and he has available all the materials he needs to give his ideas visual representation. He has no equipment to carry any heavier than a piece of chalk.

b) It is adaptable. The flexible nature of the blackboard makes it possible for the instructor to adapt it to a great many teaching needs. It also provides him with almost unlimited opportunity for variation and experiment. His approach and presentation can vary from lesson to lesson with consequent opportunities for

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improvement. Every bit of his blackboard work can be tailor made to fit any type of teaching problem.

c) It is "active." One of the chief advantages of the blackboard as a visual aid lies in the fact that the construction of blackboard work brings into the teaching situation an element of activity which gives pace to the learning process. In a well-taught lesson the student has the feeling of having participated in the building of the blackboard work. He may even have participated physically although in army instruction the opportunities for student work at the blackboard are usually, very much limited.

d) It is progressive. By giving the instructor an opportunity to build his lesson step by step before the eyes of the class, the blackboard gives him a more certain control over the rate of learning of his men. It makes it easy for him to focus attention exactly where he wants it for as long a time as he desires. It becomes practically impossible for his men to lose the scheme of his presentation, because they can actually see it unfolding before their eyes. This is an especially important point where diagrams are concerned. The blackboard allows the instructor to *build* his picture one logical point after another. In this way his men are able to grasp the concepts one by one and in the order which he thinks easiest for them to follow. Logical relationships become more apparent. The men are less likely to become confused by what might otherwise be a bewildering array of lines, curves, and angles.

Uses

A good deal of the reason why some instructors don't use the blackboard more effectively is explained by their failure to realize the many uses to which a blackboard can be put. Generally speaking, the purpose of the blackboard is to enable the instructor to explain or emphasize a concept, fact, or idea by giving it graphic representation. More specifically, a blackboard can be used for the following purposes:

To list: (1) steps in operation, (2) main steps or units of a lesson, (3) strange terms and nomenclature, (4) examination and key questions, (5) summaries, outlines, and key points of a lesson, (6) sources and references, (7) assignments.

To illustrate: (1) materiel, (2) flow diagrams, e.g., distribution of requisitions, (3) theories, e.g., electronic, molecular, etc., (4) geographic and tactical situations, (5) plan, three view, schematic and pictorial drawings.

To supplement other visual aids: One of the limitations of a ready-made chart or diagram is the fact that the instructor can't "build" it before the eyes of his men. It is possible, therefore, that the concepts they grasp will either lack the proper sequence or else be so numerous as to be confusing. For this reason it is sometimes advisable to precede or to accompany the use of the chart with a few explanatory blackboard sketches. This is especially true where the chart depicts a piece of complicated equipment or where the instructor wishes to show the action of a moving part. It is helpful, too, when he wishes to call attention to something which is not visible at the angle from which the drawing was made. At any rate the instructor should not forget that the usefulness of a visual aid can frequently be enhanced by a sensible utilization of the blackboard.

To high light: In teaching technical subjects, it is often necessary to emphasize the position of one part with respect to the others of a group. Typical examples of this might include an ignition system, the main arteries of the body or special terrain features. In such cases colored chalk can be used very effectively to focus attention and produce sharp mental images. Some colored chalks, however, have a very low visibility and should be used only under the most favorable lighting conditions.

How to Use the Blackboard

Blackboard work should be planned: In order to avoid some of the errors commonly found in blackboard work, the instructor must keep in mind a principle which applies to all visual aids but which is especially applicable to the blackboard. It is just as easy for a visual aid to convey an erroneous sense impression as a correct one. For this reason it is absolutely essential that the instructor plan his blackboard work carefully in order to have it function as an integral part of his lesson rather than as a series of interruptions. To do this the instructor should ask himself these questions:

1. What parts of this lesson are important enough to emphasize by putting them on the board?
2. What diagrams can I use to get the difficult points of this lesson across?
3. How can I use the blackboard to help the men take the notes I want them to take?
4. Will any of this blackboard work consume too much time? Would it be better to have it mimeographed? Should it be placed on the blackboard before the class starts?
5. What will this material look like when it is on the board? Is there any of it which should be left up there for the entire lesson? On which part of the board should each of these items be placed? Will they stand in some logical relationship to each other?

Use the blackboard for what it is — a means of communication: It is a sort of visible *voice* and the instructor must decide not only what he wants to say but also exactly how he wants to say it. He must be careful to plan his work so that when he uses the blackboard to *speak* to his men he will say what he wants to say as emphatically and clearly as possible. He should:

1. Erase whatever phrases or diagrams he is no longer using.
2. Make sure the men have had sufficient opportunity to copy drawings and other materials into their notes.
3. Arrange the class so that no one has any difficulty reading what is on the board. Be careful of blind spots caused by glare.
4. Plan the blackboard work so that the materials on the board stand in some logical relationship to each other.
5. Draw or write quickly so that class interest will not lag.
6. Write, print, or draw legibly. A little practice can do a great deal to improve both quality of blackboard work and the speed in which it is put on.
7. Use a pointer when explaining in order to give the class a more unobstructed view of the board.
8. Try out the blackboard work before the class meets. This should be done either on an actual blackboard or on a sheet of paper shaped like the board that is going to be used. The usual board is a good deal longer from left to right than it is from top to bottom. Unless the instructor takes this fact into consideration he is likely to find that his drawings will become crowded and out of proportion.
9. Avoid using unnecessary words. Provided the meaning is clear, a phrase is better than a sentence; a word is better than a phrase.

Avoid talking to the blackboard to such an extent the class contact is lost: It is practically impossible for an instructor to make any extended use of the blackboard without occasionally talking in its direction. There is nothing wrong with this. There is, however, something very definitely wrong with the instructor who becomes so involved in putting his material on the board that he turns his back upon the class and seems to forget that it exists. Because he is no longer looking at the men he is unable to notice the effect his words are having upon them. His voice drops to a low monotone and very soon he is talking only to himself. Talking to the blackboard is a habit which is easily broken. All the instructor has to do is recognize the fact that in most cases a man who talks to the blackboard does so because he has not planned his blackboard material to the point that he is absolutely sure of what comes next. He has to do his planning as he goes along. He concentrates on his work in order to avoid making an error. The results are always the same. He becomes difficult to hear and difficult to follow. His men rapidly become interested in other things.

Conclusion

Blackboard work is a one-man job. If it is poorly done, if it is confused and inaccurate, if it is lacking in sharpness

and emphasis, there is only one man to blame. The instructor should get into the habit of being as critical of his own blackboard work as he is of the charts and films and film strips supplied him by others. In no other way will he ever learn to get the most out of what is, beyond a doubt, the most potent training aid at his disposal. No other aid allows the instructor so much opportunity to give free play to his ingenuity. No other aid can do so much to help him solve the many problems which make up his teaching day. Not until he has learned to use it effectively will his work take on the sureness and certainty that is characteristic of the skilled worker in all trades and professions.

Tool Storage: A Place for Everything and Everything in its Place

G. H. SILVIUS* and H. J. JOHNSON**

From the largest industrial plant to the smallest home workshop, wherever tools are used, the problem of storing them is present. If it is only a knife, proper care should be exercised in storing it to prevent the formation of oxide and the dulling of the cutting edge. We expect tools to become dull and possibly broken as they are used, but it is unforgivable to have it happen because of improper storage. It is the responsibility of shop instructors to teach the correct care of tools in storage as well as in use. This can best be accomplished through the example of storage systems in school shops. The teacher must stress the proper way to handle tools as they are placed in the rack to prevent injury to the person and to the tools. It is an established principle that each tool should have its specific place and that it be kept there when not in use.

The purpose of this article is to point out important factors that should be considered by the teacher in planning for adequate tool storage in the school shop.

The plan for tool storage in the general shop should be carefully considered by the teacher. The plan in use may or may not be the most satisfactory for the given situation and should be studied to determine whether the best results are being obtained.

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Methods of Storing Tools

Specifications for four methods of tool storage will be considered:

a) Tool crib or toolroom
b) Panels
c) Cabinet
d) Kits

Tool Crib or Toolroom

The tool crib or toolroom should be a space of sufficient size to permit the placement of panels, shelves, and drawers that may be needed for the storage of the tools as well as space for necessary aisles and passageways between them to permit accessibility to all tools and equipment. It shall be entirely enclosed by partitions of wood, masonry, diamond grill, or some other suitable material that will insure security. The door shall be equipped with a lock and service window. A counter shall be provided on the service window covered with linoleum or some other material to protect the tools. The door is to be equipped so that it can be locked from the inside by a tool attendant. The floors, walls, and ceiling shall be reasonably free from moisture. All panels, shelves, and drawers shall be well illuminated to insure ease in locating and checking tools. All accommodations for checking tools in and out shall be within the crib.

A well organized tool crib at the Washington Vocational School, Detroit

Panels

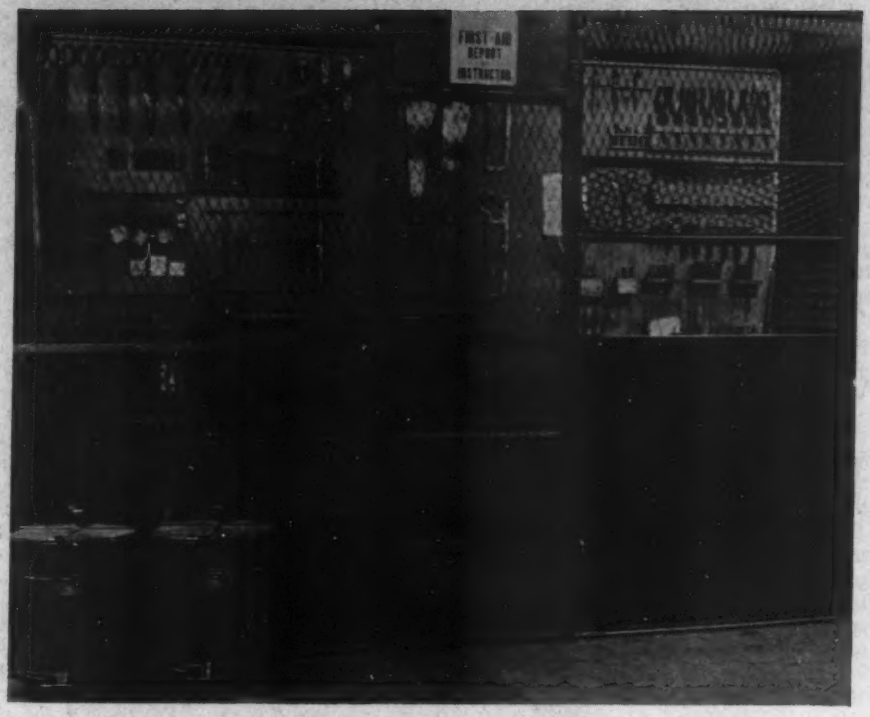
The panels can be either of the open or closed type and of a size to accommodate the tools to be placed on the panel without crowding. If enclosed, the door may be grilled, glazed, or paneled. It may be hung on the wall or may be portable. Methods of fastening tools shall be such as to prevent tools from falling.

Cabinets

Cabinets can be either of the built-in or kitchen-cabinet type. They shall be larger than the enclosed panel, size being the chief distinction. All cabinets shall be provided with locks.

Kits

Kits considered in this article shall be for the common essential hand tools used in a particular activity. The extent to which this can be done depends upon the number of available tools. Tools less frequently used shall be obtained from a central storage space (panel, crib, or cabinet). The kit may be stored either at the work station or in the crib. It is a specified set of tools kept as a unit, and used for a specific set of operations.



Tools are carefully racked in the shops at the Fordson High School, Dearborn, Mich.

Many teachers may find it convenient to use combinations of the described methods. No one type of storage will be satisfactory in all situations. Where hand tools should be kept and how they should be made available depends greatly upon the students being served. In many shops such as auto mechanics, aircraft, and machine shops, teachers prefer to use the toolroom so that most or all of the tools may be issued through some checking system.

In other shops, some of the tools are kept in conveniently located cabinets, on wallboards, in individual kits, or at the work station. The system should be worked out with due regard to convenience, ease of checking, and security.

Kits for drafting instruments

Instrument panel with checking system at the Nolan Intermediate School, Detroit

One of the chief objections to the tool crib is the time required to check tools in and out at the beginning and end of the period. Where shop periods are of one hour duration or less, the time spent getting and returning tools is a major problem. If the class is large, twenty minutes or more may be used in getting and returning tools; in addition to the time problem, the boys in line are inclined to indulge in horseplay.

Sometimes the students in the toolroom show partiality by giving the better tools to their friends. However, the alert teacher will not find this objectionable because it presents an opportunity to teach honesty and fairness. Some teachers object to the crib because it is necessary to have a student spend his time as a toolroom attendant. This, too, affords an educational opportunity to the alert teacher to teach tool recognition, the care and maintenance of tools, and toolroom procedures.

The big advantage of the tool crib is the centralization of all tools under one lock with the supervision of one or more tool attendants; the tools are all in one place and can be checked easily. The checking records are also in one place, which makes it very convenient if more than one teacher uses the same shop. It also parallels a true industrial situation and acquaints the boy with procedures that are used in industries.

Open panel in the Post Intermediate School, Detroit

The chief disadvantages of the panel, particularly the open panel, is the difficulty of placing responsibility on the student for checking and returning the tools. Then, too, tools may easily be borrowed by someone not connected with the shop. This system often proves embarrassing if more than one instructor teaches in the same shop.

Tools are more easily detected because the panels are out in the open and easily seen. Another advantage of the panel is having the tools close to the areas in which they are to be used so that they can be obtained without delay. Panels with tools for a particular machine should be placed near the machine.

The cabinet may be considered as combining some of the characteristics of both

the panel and the crib. Several cabinets may be placed around in the shop; one tool cabinet to take care of each area. This relieves the problem at the beginning and end of the period but increases the checking problem. The tools can be locked up, eliminating the possibility of having something taken when the teacher is out of the shop, as is possible with the open panel. The tools are more easily checked than in the crib because of the smaller number in one place.

Usually by combining two or more of the methods of storage, more satisfactory results may be obtained. Often if there is a crib in the shop the teacher may use it as a storage center and use portable panels and kits, returning them to the crib at the end of the class period or the end of the day. Thus the tools are easily accessible during the class period, but are safely locked up when not in use. With the pupil personnel, organization officers may be appointed to see that all panels and kits are taken out and returned to the crib.

Factors to Consider in Planning for Tool Storage

Location and Light

One of the first considerations should be convenience or accessibility. Probably from this point of view, the exact center of the shop would be the most desirable place to locate tools if one centralized crib is to be used. All areas of the shop would then be served with equal conservation of time. The chief objection to such a plan is the obstruction of the teacher's view to all parts of the room. The tools should be as near the area in which they are to be used as possible. When panels and kits are used, the problem is a simple one, but when the crib or single cabinet methods are used, much consideration should be given a central location. A second point concerning the location of the storage space is the desirability of natural light. The storage space should have plenty of natural light, providing it is not at the expense of good lighting for work stations. Natural lighting should be supplemented with artificial light to illuminate all panels, shelves, and drawers whenever necessary. This facilitates locating and checking the tools.

Moisture

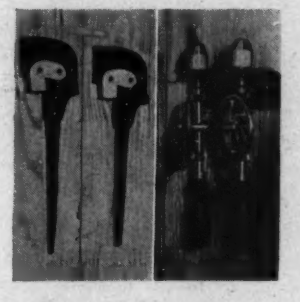
A third point is to keep tools away from excessive moisture. Obviously, excessive moisture causes oxide to form on the metal parts of the tools. Outside basement walls are damp. If for any reason a part of the shop is exposed to an undue amount of moisture, *do not store tools there.*

Size of Cabinet and Floor Area

The size of the storage space will vary with the type and number of tools to be kept. The storage space should accommodate all of the tools to be stored, with the proper type of holder for each tool. It should never be necessary to "pile up" tools. Adequate provision should be made for storing extra or special tools that are used infrequently. For ease of checking, there should be space enough for every tool to have its place. If all tools are to be located in one place, such as a crib or cabinet, additional space is required for passages, a place for a checking system, and a counter for passing out and receiving tools. If each area has its own storage space, that is, by having panels hung on the wall or cabinets placed near the work stations, less floor area is required than with the central tool crib.

Toolholders

Care must be taken in providing clips or holders for the tools. When possible, the holding device should be made so that the tool fits only in the correct position. This compels the student to replace the tool in the proper way. If this point is carefully considered, all tools will be returned to their correct places, which greatly facilitates checking. All toolholders on panels or shelves should be designed to insure positive gripping of the tools. Many tools are broken because of poorly designed holding brackets or clips. Outlines of the tools in contrasting colors may be painted on the background behind the tools, making it easy to locate the place for a tool or to detect its absence.



The tool fits only in the correct position

Sloping Shelves

If shelves are slightly inclined toward the front, the backs of the shelves and upper shelves are easily visible. Thus, by standing back from them a few steps, one can tell if all tools are in place. In this way shelves slightly above eye level may be utilized.

Locked Visible Panels

When enclosed panels are used, the doors may be paneled with glass to facilitate checking tools without unlocking the door. Very often panels of this type can be used in the tool crib for precision tools such as micrometers and calipers. This also provides double protection for the costly tools. Heavy screen wire may also be used instead of the glass paneling.

Easy Cleaning

Regardless of how tools are kept stored it is essential that the storage space be kept clean. Inaccessible nooks and waste spaces should be avoided. Hand bellows and a desk brush should be kept at some convenient place in the toolroom for cleaning the shelves, panels, and drawers. Space under cabinets or drawers should be either completely enclosed or accessible for thorough cleaning with a floor brush.

Protect Cutting Edges

When tools such as planes, spoke shaves, knives, saws, and other cutting tools are stored, particular attention should be given to the protection of the cutting edges. The bed of a plane should not rest flat on a shelf. Spoke shaves should be hung from handles; saws should be hung or placed in slots so that the teeth are clear. Chisels may be placed flat on shelves with the bevel down. This raises the cutting edge above the shelf and affords some protection. Tools with cutting edges should never

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Sloping shelves facilitate location and checking of tools. Photograph taken at the McMichael Intermediate School, Detroit

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

John J. Metz, Editor

A Contribution to the War Effort

The results of the educational work done with the men in the armed forces and in training war-production workers have opened the eyes of educators the world over. It is true that the impressions produced have not always been entirely correct.

There are some, for instance, who think that henceforth the schools can train tradesmen in a matter of months. These critics seem to think that industry as well as the schools with their four-year courses and apprenticeships actually robbed their students, in the past, of much time in preparing them for their life's work. Evidently those who speak about the success of the short intensive courses now given to workers in war-production factories lose sight of the fact that only narrowly specialized workers are produced under the type of training used to overcome man-power shortages.

To train all-round mechanics will still take years, and courses for training tradesmen will have to reckon with time intervals larger than 100 or 200 class hours, even though such short periods are found long enough to prepare workers for some of the processes which certain classes of production work require.

The people who think present methods of teaching vocational subjects are entirely new are those who do not know the difference between training the skilled and the semiskilled worker.

The methods used by the army for training inductees has also been successful, largely because the methods that have been employed have been developed and used for many years by teachers of industrial arts and vocational education. As a matter of fact, the War Department wisely turned over the work for training its personnel in many instances to men who had demonstrated their ability as teachers. To mention just a few names of men who have done outstanding work in developing courses and methods for training the men in our armed forces, or to prepare those who were to teach the new inductees, we might call attention to Lt. Col. Verne C. Fryklund and his fine corps of co-workers who formed the early staff of the Teacher Training Department of the Armored Force School at Fort Knox, Ky., or Lt. Comdr. Charles C. Caveny who is the educational officer at the Navy Pier, Chicago, Ill.

It was outstanding educators like these who set the standards within the armed forces, while the strenuous efforts and organizing skill of the national, state, and local vocational education departments did such excellent work at making the training of production workers so successful.

Fortified by these experiences, vocational educators may be relied upon to do excellent work in outlining what they, in their particular field of education must do for returning servicemen and for war-production workers, whose specialized skills may be a drug on the market, just as soon as the war is over.

Vocational education and industrial arts have demonstrated that they occupy an important place in the education of our American youth. Both of these educational endeavors have received much complimentary comment throughout the past few years. It is hoped, therefore, that the future will deal justly with our youth, and that a country which has found out how necessary it is to have the young get a wide experience with practical education, will also see to it that sufficient financial aid from national, state, and local sources will be forthcoming to continue that type of education after the flurry and furor of the present turmoil is over.

A Great Vocational Educator Passes On

The death of Dr. Robert L. Cooley, which occurred on May 19, 1944, ended the career of a great man, a great educator, and a real pioneer in the field of vocational education.

From his earliest youth he was accustomed to hard physical labor. His elementary education was largely acquired by attending school during the winter months, when he could be spared from his father's farm. Besides the farm, Dr. Cooley's father operated a lumber mill, and also made plows, wagons, and sleighs. Young Cooley, therefore, got a good background of practical training.

No doubt he was tired out after a day in the fields or in the factory; nevertheless, he studied at home to such good effect that he earned a teacher's certificate when he had attained the age of 17. Although he had never attended high school, his preparation for the examinations to secure his teacher's certificate had given him such a well-rounded fund of knowledge that he was able to enter Oshkosh Normal, now Oshkosh State Teachers College, in 1890.

After he was graduated from this institution he taught mathematics and science, and then began his administrative training, first as principal of a high school, then superintendent of a school system in a small city. This was followed by nine years of service as principal of an elementary school in Milwaukee. Then when Wisconsin passed its continuation school law in 1911, he was chosen as director of the continuation school that was opened in Milwaukee. He held this position until he resigned on April 1, 1940.

In those early days of the continuation school which later became known as the Milwaukee Vocational School, Dr. Cooley really showed his stature as an organizer and administrator. He had no pattern to follow and yet he succeeded to build up a school which has an international reputation.

Into the Milwaukee Vocational School Dr. Cooley put more than merely the 31 years which he spent as its principal, for he literally gave to the school all of himself. Time meant nothing to him when it came to do anything for his school. For the school he drove himself relentlessly onward, and personal ease was never considered when some condition arose that demanded his attention and decision.

It was this concentration which caused his health to break in January, 1937, and while he recovered for a brief time, ill-health dogged his steps until his death.

In recognition of his outstanding contribution to vocational education, and in particular to the Milwaukee Vocational School, the Board of Vocational and Adult Education of Milwaukee has decided to perpetuate Dr. Cooley's name in connection with the school he erected and loved, by giving the name "Cooley Hall" to the large auditorium of which he himself was so proud.

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be placed loosely in a drawer, because if that were done, the cutting edges would be subjected to severe abuse. The screws and cutting edges of auger bits must be well protected.

Warping and Distortion

Such tools as wooden beam compasses and wooden rules should be placed on shelves or hung in such a manner as to give the necessary support and prevent the tool from warping. Such tools as handsaws and framing squares should be hung to prevent distortion.

Safety Factors

It should never be necessary to grip the cutting edge of a tool to remove it from the holder. The holder should be designed so that the tool is gripped naturally by the handle. Tools or handles should not project out into the aisle. Heavier tools should be placed near the bottom of the panel or cabinet. All holders should have a positive grip so tools will not fall when they are carelessly removed or placed on the rack.

As pointed out before, no one storage method will be satisfactory for all situations. However, for the small shop the cabinet would probably prove most satisfactory. For the large shop, the crib or several cabinets may prove better. If the loss of tools through theft or borrowing can be disregarded, panels are more convenient and may be the most satisfactory. Kits of special tools may be made up, such as a complete set of tools for the wood-turning lathe, and kept in a cabinet or crib. These kits are issued at the beginning of the period and returned at the end of the period.

It is important that the teacher keep the following points in mind when planning for tool storage in a shop:

Accessibility and convenience
Ease of checking
Security of tools
Orderliness and cleanliness
Safety

The following articles that have appeared in INDUSTRIAL ARTS AND VOCATIONAL EDUCATION magazine are recommended:

Jochem, C. M., "Tool and Hardware Cabinet," April, 1936, pp. 126–128.

McNamee, Philip L., "A Program for Conserving Shop Tools and Equipment," November, 1942, pp. 365–368.

Nelson, Howard C., "A Toolroom Report," November, 1941, pp. 396–397.

Short, Henry C., "Simplifying Tool Checking in the Machine Shop," December, 1941, pp. 442–443.

Southard, E. L., Lockett, V. J., Black, M. M., "Controlling Theft in the School Shop," February, 1936, pp. 55–58.

Struck, F. Theodore, "Examples of Good Housekeeping," November, 1941, pp. 371–373, 378.

Technical Trade Schools

R. T. CRAIGO*

The rapidly growing demand and planning for separate *technical vocational schools* calls for a careful consideration of what we have and its expansion, before we start off through the woods on a new path, and throw overboard what we have built up during thirty years.

Since any movement is built up around personnel, and is developed and operated by personnel, maybe we should first look at ourselves in the mirror.

The vocational field is built up and operated by three types of men who enter this specialized field through one of three doors: from the trade, from colleges of education, and from engineering colleges and/or engineering fields.

These three groups approach and carry on in the field of vocational education with entirely different backgrounds and apperceptive bases.

The tradesman may have become a foreman, and realizes the importance of training; the educator has pursued the field of education and enters through that portal; the engineer has experienced a still different background.

Each of these three types brings a different background into the field, and his procedure is colored accordingly. This results in three different sets of *objectives* and *procedures;* it also results in three different sets of *standards.*

It is highly desirable that the three resulting sets of objectives, procedures, and standards be integrated. This can be done; however, the resulting integration cannot help but reflect the three types of preparation for the job of teaching. These differences frequently show up in what may be listed as majors and minors. The tradesman rightly majors on the side of practicality; he wants big commercial-sized equipment; he insists on intensely practical instruction; his standard is "the trade standard." He may underestimate instructional methods; social and civic values and adjustment may not be in his vision.

The educator emphasizes the instructional methods; he may overemphasize instructional technique; he may stress social and civic adjustment; he is interested in the economic life of the community. Where the tradesman emphasizes the opportunities for trained workers, the educator includes in his reasoning many altruistic ideals such as those affecting the employers, the community, and often the broader interests of the city, state, and nation.

The engineer usually approaches the field by combining the practical and the technical phases. He sees the area between the tradesman and the engineer. The engineer in industry designs the layout; he draws up the plans and specifications; he computes sizes, strengths, stresses and strains, motions and mechanics. He has the technical approach. The product and results of his field must then be interpreted into the blueprints and working drawings for the shop. They must also be brought from the engineering or technical level down to the shop level. This is often done through an intermediate area, field, or department. Sometimes it is called the *methods department;* sometimes it is the cost department, or routing department, or operating department.

The present exploration of the so-called *technical training* field must make due allowance for these three types of men whose background must necessarily color the whole movement.

There may result a school swinging over into the field or area of the junior college or teacher-training institution if the educator type predominates. Or we may find the trade school becoming a pseudo engineering college if the engineer predominates. Or we may find the trade school continuing on the lower levels and failing to keep abreast of the times by neglecting the advances in industry. The advances in industry are based on the impact of applied science on the trades and industry. This in turn draws in many technical approaches, and therefore demands a so-called "practical technical" setup.

What is the solution is of foremost importance, and may be set up as follows:

When the Smith-Hughes Act was formed in 1917, our age area in vocational work was "over 14." As a result we were limited to lower levels in trade training, and set up two-year courses at the beginning level suited to immature 14-year-old boys.

As the years rolled by we found (at least at Dunwoody Institute) that our area rose from 14–16 to 15–17, and later to 16–18, and before the World War to 17–19 and even 18–20 year youth. Furthermore, we found a very desirable growth of the following groups: the former 14–16 or 15–17 Dunwoody student frequently returned after one or two years in the trade to get more advanced train-

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ing (both in day and evening school). This called for setting up a third or more advanced year. We also found an increasing number of high school graduates 17 to 19 entering Dunwoody; this group called for a higher level of training than did the old 14–16 group. A third specific group included those who either had graduated from high school or dropped out of high school in their third or fourth year and gone to work. This last group furnishes a desirable student, and he likewise needs a more advanced approach.

Therefore, the following solution is suggested: Instead of starting out to develop a new and untried technical course, why not continue the present two-year course and add a third year, or more advanced course, calling the third-year course the "practical-technical" level or course?

We have found that lower age and ability levels will then take the first two years; while the better students will continue in the more advanced (third-year or practical-technical level); others after two years get a job. The latter may then return in dull seasons or during layoff periods in day school, or return to evening school. With the proper entrance setup, the more advanced group can enter Dunwoody in the second year of the two-year course, and take the second and third years. They may even review or take a part only of the first year if needed for foundation for the second and third years.

The foregoing procedure would be far more preferable than to set up two types of schools: the *old* two-year trade school, and a *new* separate and distinct technical school. The combined school would save overhead and duplication and avoid discrimination.

For nearly twenty of its thirty years' existence, Dunwoody has carried out this plan; and, at least in this northwestern territory, it works!

Our experience shows that neither in the school nor out in industry are there any sharp dividing lines, or even broad dividing bands or zones between (practical) trade training, technical trade training, and engineering training. The trade school graduate may later on be doing design or development or research work (often classified as technical or engineering); at the same time the engineering graduate often is at work out in the shop beside the trade school trained men.

We already have two schools: the trade school and the engineering college. Many of us know that these two schools have some overlapping. Why introduce a third school to increase the costs and still further confuse the training, the student, the taxpayer, the administration, and the employer?

Radio for Vocational and Industrial-Arts Classes

RALPH O. WILLIAMS*

The title of this article might well be "Instruction in Radio and Electronics . . ." because, of late, vacuum tubes have found such a wide application to all sorts of industrial uses that radio no longer has the exclusive claim upon them.

Radio vacuum tubes and typical radio circuits have been put to use at such jobs as induction heating of plywood, heat-treatment of steel, supercharger regulators for multiengined airplanes, control of timing in welding systems, motor speed control, supersonics, and radar. This list indicates only remotely the many applications of the vacuum tube and its related circuits to industry. The operation of all such devices are easily understood by the students of modern courses in radio. One of the first prerequisites to the study of electronics is a vivid imagination. In spite of the high-sounding names and big words, the most complex device can be reduced to components that operate according to relatively simple and well-established basic laws easily understood by the alert high school youngster or the sincere adult with sufficient imagination to see water flowing in a pipe when he cannot see the end of it.

The radio-electronics student, because of the broad scope of his field, is as necessary to industry today as the screw-driver electrician, and in fact that's about all it amounts to — using the screw driver intelligently! His training in the fundamentals must be thorough and complete, he must be able to explain any electrical operation in terms of moving electrons and have such a complete knowledge of the basic theories of alternating current circuits that he fears nothing. He does not have to be a mathematician, except in a very general way, any more than the boy who shoots a squirrel has to be an expert on ballistics. It is up to his teachers to explain to him how to aim the gun, and shoot, and hit the target; and then in a subtle way make him see how study and research make it possible not only to shoot but design bigger guns and hit bigger and more distant targets. While course outlines and good books are fine aids to instruction, the real success in producing good men lies in the teacher's ability to understand each student's situation, personality, and private ambition; act as his counselor on all matters; and to command respect by a thorough knowledge of the subject and a sincere desire to help others to succeed.

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Opportunities in the Field of Radio

The broad field of radio and electronics provides many interests for its explorers and certainly the opportunities for future employment are practically unlimited. The major divisions of the applications of vacuum tubes to communications, industry, and research, which are all open to the man with a good background in the fundamentals of radio, may be outlined as follows:

I. Communications — (1) radio, telephone, and telegraph; (2) military; (3) aviation; (4) facsimile (wireless printers); (5) telephoto (wireless pictures); (6) sound; (7) hearing aids; (8) recording.

II. Industry — (1) welding; (2) protection and detection; (3) induction heating; (4) power companies; (5) geophysics (scientific exploration for oil); (6) motor controls.

III. Research — (1) measurements; (2) medicine; (3) electron microscopes; (4) X-rays.

Opportunities for employment exist in all of the following divisions of radio:

I. Radio Operating
   1. Radio telephone — (*a*) broadcast; (*b*) police and fire; (*c*) coastal and ship to harbor; (*d*) aviation; (*e*) special emergency; (*f*) experimental; (*g*) amateur.
   2. Radio telegraph — (*a*) point to point on land; (*b*) ship services and ship to shore; (*c*) aircraft; (*d*) geophysical; (*e*) amateur.

II. Radio Service and Maintenance — (1) home broadcast receivers; (2) aviation; (3) forestry; (4) police; (5) sound systems and recording; (6) photoelectric devices; (7) wired wireless, intercommunication systems; (8) industrial electronic controls; (9) frequency measurement.

III. Radio Engineering — (1) research; (2) development; (3) production.

All in the fields of transmitting and receiving voice, pictures, and television. Also applications of radar and television prin-

ciples to aviation flight control, blind landing systems, and direction finding.

The Federal Communications Commission and Licensing

No radio transmitting station may be operated without a license and no licensed radio station may be operated without a licensed radio operator at the controls. Maintenance of transmitting equipment must be done by properly licensed men.

The Federal Communications Commission issues the following operator licenses to those able to qualify by passing their examinations:

a) Radiotelephone second class
b) Radiotelephone first class
c) Radiotelegraph second class
d) Radiotelegraph first class
e) Restricted radiotelephone operator permit
f) Restricted radiotelegraph operator permit
g) Amateur Classes A, B, and C.

Each of the above classes of licenses carries with it certain operator's authority and responsibility.

One may prepare for examinations for the above licenses by studying the various publications and study guides printed for this purpose by the Federal Communications Commission and commercial book companies, most notable of which is Nilson and Hornung's famous "Radio Operators' Questions and Answers."

Courses of Study

A shop course in radio consisting of tearing down and building up sets, replacing defective parts, and testing tubes is a malicious waste of time. It develops tinkerers and pseudo technicians of which there are too many at present. The acute shortage of radiomen who *know* and *can do* is in part the result of too much haphazard instruction by men who either do not know the subject themselves or do not realize the importance of teaching basic fundamentals of electricity and magnetism along with shopwork. In almost all radio work the most needed tools are the screw driver and pliers. The important thing is where and when *not* to use them, and why. Therefore, the first part of any radio course must be a physics course in electricity and magnetism, followed later on by a treatment of radio circuit theory. The fundamentals of mathematics are important, but in the beginning simple algebra is sufficient, and if the student does not have it, the rudiments can be taught in a few hours. A few certain stock formulas may be learned that will suffice for a long time. Thinking and doing in radio are inseparable. Students will sleep in a theory lecture and waste their time and school equipment in a purely mechanical shop. The shop must provide facilities for the individual so he can demonstrate to his own satisfaction the principles he is being taught. This can best be done, not by class demonstrations, but by supervised individual experiments where the student sets up the apparatus and arrives at the result under his own power.

Particular emphasis should be placed on alternating currents and alternating current circuits since all of radio consists of vacuum tubes and the application of alternating current circuits. From this point the student goes into the application of all he has learned to commercial equipment and gets experience in installation, adjustment, and maintenance. All along the course he is constantly reminded of the application of basic principles and the desirability of continuing his study in mathematics, not only for his use in practice, but so he can read with some degree of intelligence the worth-while technical periodicals.

Part I of the outline which follows represents a fundamental course for any branch of electricity from house wiring to radar. The emphasis placed by the instructor on any unit in the outline will depend upon the background and objectives of the student, ingenuity of the instructor, and physical facilities of the school. Parts IX through XXI deal exclusively with radio and electronics with emphasis on aviation equipment.

Entrance Examinations. Entrance examinations are given which are pretests for radio and mathematical knowledge and help the instructor fit the student in the Course Outline and Project List so he will waste no time going over ground with which he is already familiar. Some of the prospective students after getting a good look at our pretest for mathematical knowledge left in such a cloud of dust that we never got a chance to explain to them that they could reach most of their objectives without being able to solve all of the problems. Our national weakness is in mathematics, and the one sure way to lose what might otherwise be a good radioman is to scare him away by a mathematics test. These tests are very valuable to both the instructor and the student if correctly presented. They let the student see what he might know, and let the instructor know about where the student is in his mathematical progress.

Outline of Course

Part I

I. Radio mathematics
II. Units, metric and British
III. Electricity and magnetism
  1. The electron theory of matter
  2. Direct current electricity
  3. Ohm's law and Kirchhoff's laws
  4. Magnetism
  5. Electrostatics and condensers
  6. Electromagnetism and induced currents
  7. Alternating current
  8. Batteries and chemical effects of current
  9. Generators, motors, and converters
IV. Vacuum tubes
V. Test instruments, group I
VI. Workshop practice
VII. Radio schematic drawings and parts identification
VIII. Frequency, wave length, and propagation
IX. Power supplies

Part II

I. Audiofrequency circuits
II. Radio frequency circuits
III. Radio test instruments, Group II
IV. Typical receiver circuits
V. Circuit analysis and location of faults
VI. Transmitting circuits
VII. Antennae, transmitting and receiving
VIII. Location of faults in transmitters
IX. Ultrahigh frequency technique
X. Transmitter frequency measurements
XI. Bonding and shielding of aircraft
XII. Aircraft radio installation

Projects for the Shop

The number of shop projects in radio is unlimited. Each instructor should make up his list of projects based upon his physical facilities and use it only as a guide, devising special jobs to fit the individual student as he goes along in his radio training. No one student need perform all tasks but only those required to give him a full understanding of the thing he is studying. The two lists which follow are in constant state of revision and in some cases ignored completely. A student may be familiar with some of the subjects on the list, in which case he is started at one with which he is not familiar and then he goes on from there. His interests might be, as were the interests of one student, in developing a photoelectric device for automatically following the edge of a pattern for cutting fabric around complicated designs at high speeds. Electronic circuits surrounding the use of photocells were stressed with him. He was given the simple mathematics required, and enough workshop practice to enable him to design and construct the device which he wanted. Of course, his problem was not on our job list.

Another student was a research chemist who had a good mathematical background, but wanted to get into radio. Our chief contribution to him was in the use of hand tools and radio circuit layout. Then, of course, there are the high school boys with an interest in radio — no adult can keep up with them; they have imagination, ability, and they work hard. They do all the projects in the list and cry for more.

Job Outline

Part I

1. Sharpen screw driver
2. Sharpen drills
3. Tin a soldering iron
4. Solder
5. Connect wires to lugs
6. Lace wiring
7. Wire a chassis
8. Read color code
9. Build voltmeter
10. Build milliammeter
11. Wheatstone's bridge
12. Build ohmmeter
13. Plot Eg-Ip Curves
14. Measure plate resistance
15. Measure amplification factor
16. Audio Amp. Cath. R. Bias

17. High-voltage power supply
18. Voltage regulation curves
19. Connecting E regulator tubes
20. Winding transformer
21. Power supply first choke
22. Bleeder resistor design
23. Build voltage regulator
24. PP Class A Amp With Phase In
25. Self-excited oscillator
26. Crystal oscillator
27. Check frequency of test osc.
28. Vacuum tube voltmeter
29. Electron ray indicator
30. Build and connect B.F.O.
31. Connect output indicator
32. Build regenerative detector
33. Adjust T.R.F. receiver
34. Adjust and align superheterodyn
35. Shoot trouble in pwr. supply
36. Shoot trouble in A.F. Ckts.
37. Shoot trouble in Det. Ckts.
38. Shoot trouble in I.F. Ckts.
39. Shoot trouble in mixer stage
40. Shoot trouble in osc. stage
41. Shoot trouble in T.R.F. stage
42. Adjust B.F.O.
43. Action of A.F.C. circuits
44. Action of A.V.C. circuits
45. Cathode ray alignment
46. Align all-wave comm. receiver
47. Align portable WX receiver

Part II

1. Sharpen screw driver
2. Sharpen drills
3. Tin a soldering iron
4. Solder
5. Connect wires to lugs
6. Lace wiring
7. Wire a chassis
8. Read color code
9. Build voltmeter
10. Build milliammeter
11. Wheatstone's bridge
12. Build ohmmeter
13. Plot Eg-Ip Curves
14. Measure plate resistance
15. Measure amplification factor
16. Audio Amp. Cath. R. Bias
17. High-voltage power supply
18. Voltage regulation curves
19. Connecting E regulator tubes
20. Winding transformer
21. Power supply first choke
22. Bleeder resistor design
23. Build voltage regulator
24. PP Class A Amp With Phase In
25. Self-excited oscillator
26. Crystal oscillator
27. Check frequency of test osc.
28. Vacuum tube voltmeter
29. Electron ray indicator
30. Build and connect B.F.O.
31. Connect output indicator
32. Build regenerative detector
33. Adjust T.R.F. receiver
34. Adjust and align superheterodyn
35. Shoot trouble in pwr. supply
36. Shoot trouble in A.F. Ckts.
37. Shoot trouble in Det. Ckts.
38. Shoot trouble in I.F. Ckts.
39. Shoot trouble in mixer stage
40. Shoot trouble in osc. stage
41. Shoot trouble in T.R.F. stage
42. Adjust B.F.O.
43. Action of A.F.C. circuits
44. Action of A.V.C. circuits
45. Cathode ray alignment
46. Align all-wave comm. receiver
47. Align portable WX receiver
48. Calibrate D.F.
49. Install loop on Mock up
50. Align aircraft all-wave rec.
51. Run selectivity curves on R.

Problems and Projects

CHECKING LIST FOR THE DRAFTING ROOM

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The accompanying checking list is designed to help the student make sure that his drawing of a machine part is correctly made.

If each student is supplied with a copy and the instructor carefully explains each of the various items to the class as a whole, it will save much time, both for the student and for the teacher. If the student can be shown that the use of such a device will increase his rank because less mistakes and omissions will be found on his drawings, he will not have to be urged to use it. Thus, it will lessen the labor of the instructor in checking drawings so many times, and it will allow him more time to help individual students on their problems.

As a test of the ability of the student to include all the various items which go into the drawing of a machine part, require him to draw some machine part which he has never seen without the use of the checking sheet.

Checking List in Machine Drawing

Sketching: Draw object large enough to be clear.
Complete drawing in proper weights of lines.
Draw the views in proper relation to each other.
Follow special notes given and use sketches for centers and base lines as given.
Separate each part by plenty of space in a detail drawing.
Make every drawing whether a freehand or a mechanical drawing a credit to yourself and seek to improve every drawing over the last one drawn.
Dimensioning: Measure object carefully and place dimensions in their proper place.
Have all detail and over-all dimensions check.
Have all important center-to-center dimensions, etc.
All Necessary Notes Stated: List name and number of part.
List number wanted.
List kind of material by a section or by a note.
List pattern number if left on the casting.
Note: All the foregoing items can be placed in the bill of material. Mark finished surfaces, or use a special note if the part is to be finished all over. Be specific in showing which surface is to be finished. Mark special finishes. Notes on external threads — No. and kind of threads. Notes on internal threads — No. and kind of threads, tap and drill sizes. Note other special information: drill, countersink, core, ream, etc. Note title, scale, date, and number of problems and name.
Special Notes: Always place all notes as close as possible to the drawing of the item for which they are intended and repeat them as many times as necessary on the separate detail drawings. In this way the detail sheet may be cut up and distributed to separate workmen.
Miscellaneous Notes: Always draw light bolt outlines in the drawing of any V, American Standard, or square threads. Always have someone check your drawing for errors in the foregoing notations. Always draw light guide lines for any lettering that has to be done. Always seek to apply all items of knowledge previously learned on all new work and always do your best work.

ORNAMENTAL TIN CRAFT

CHRIS H. GRONEMAN
Industrial Education Department
A. & M. College of Texas
College Station, Tex.

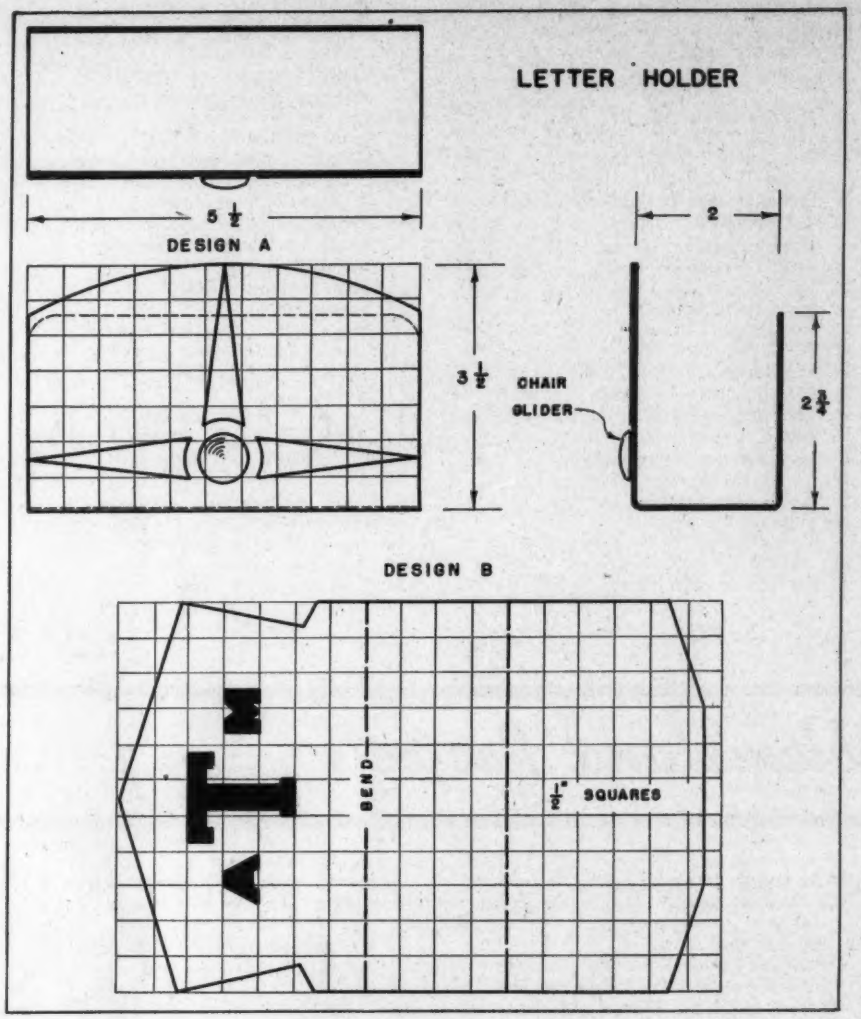
(*Continued from page 237 of the June, 1944, issue*)

Letter Holder

The letter holder is a most useful article for the desk in any home or office. Either of the designs suggested in the drawing are pleasing and offer many possibilities for variations. The overlay pattern shown in the photograph has been one of the most popular designs used by students in making ornamental tin-craft projects.

Construction of this letter holder is not difficult, but care must be taken in bending the metal to insure accuracy and neatness. Projects of this type make excellent gifts, especially if they are personalized with initials as shown in design B on the drawing. This article, like the book end, must be made of two pieces of sheet tin stock to assure the necessary strength and give the desired appearance of an art-metal problem.

When decorating with overlay pieces, it should be stressed that the overlay parts are not to be peened but should remain smooth. This contrasts with the remainder of the project which is peened on all visible portions. It is advisable to cement a piece of felt or other suitable fabric on the base of the letter holder so that the table or desk top will not become marred when this greatly used piece is moved around.



Designs for letter holder

Design A

No. of Pieces	*Material*	*Size*
2	Sheet tin	5¾ x 8¾
1	Chair glider	¾
1	Felt	2 x 5½

Solder, flux, steel wool, glue or cement for holding felt.

Tools: Alcohol burner, asbestos sheet, brush, carbon paper, copperplating setup, emery cloth, file, flat iron, heating device, jeweler's frame and blade, lead or wood block, lead weight, peening hammer, pencil, rule, scriber, soldering copper, tempera water color paint — yellow, and tin snips.

Letter holder

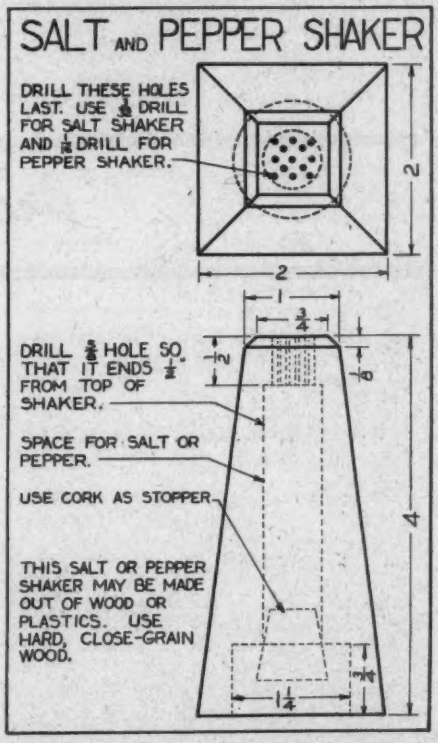
Procedure:

1. Use design as shown in the illustration, or develop an original design.
2. Cut out 2 pieces of tin stock.
3. Solder one side of each piece.
4. Sweat both pieces together with hot flat iron. Weight the soldered parts together immediately as more is sweated.
5. Apply coat of yellow tempera water paint to one side of sweated piece for design transfer.
6. Lay design sheet and carbon paper over painted portion and trace design.
7. Cut out letter holder with tin snips.
8. File and dress edges with emery or aluminum oxide cloth.
9. Drill hole and pierce if design calls for it.
10. Peen exposed surfaces on lead or wood block.
11. Remove prongs from chair glider, file edges.
12. Apply solder on edge of glider.
13. Sweat-solder glider in place with alcohol torch.
14. Cut and sweat-solder ornamental pieces in place.
15. Bend letter holder as shown in the illustrations.
16. Rub letter holder and other parts with steel wool and prepare for plating.
17. Apply thick coating of copper.
18. Polish project with steel wool. Use cloth to prevent touching metal with hands.
19. Apply coat of clear metal lacquer and allow to dry.

SALT-AND-PEPPER SHAKERS

ALBERT KOSLOFF
Industrial Arts Laboratory
Waller High School
Chicago, Ill.

The salt-and-pepper shaker shown is an easy and interesting project to make. It can be made out of wood or plastics. The processes used are drilling, filing, planing, and finishing. In finishing, the wooden shakers may be dipped in lacquer or shellac, or the finish may be brushed on. Apply transfer or decalcomania to complete finish.


SALT AND PEPPER SHAKER
DRILL THESE HOLES LAST. USE 3/8 DRILL FOR SALT SHAKER AND 1/2 DRILL FOR PEPPER SHAKER.
2
2
1
3/4
DRILL 3/8 HOLE SO THAT IT ENDS 1/2 FROM TOP OF SHAKER.
SPACE FOR SALT OR PEPPER.
USE CORK AS STOPPER
THIS SALT OR PEPPER SHAKER MAY BE MADE OUT OF WOOD OR PLASTICS. USE HARD, CLOSE-GRAIN WOOD.
4
1 1/4

VICTORY MODEL FOUR-TUBE T.R.F. RECEIVER

JAMES HOSKINS
Palo Alto, Calif.

This model of radio has been designed and tested so that a simplified model may be constructed by anyone who carefully studies the drawing and pictures as shown. The circuit is so designed that it eliminates the usual

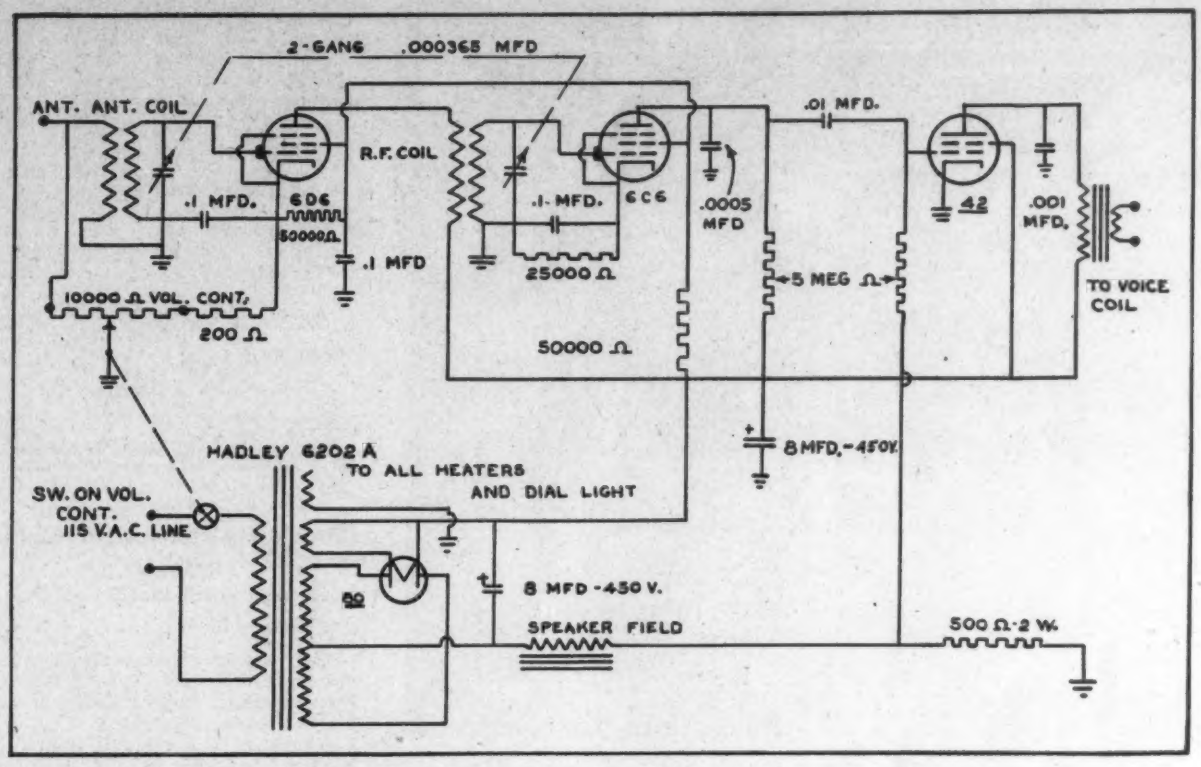


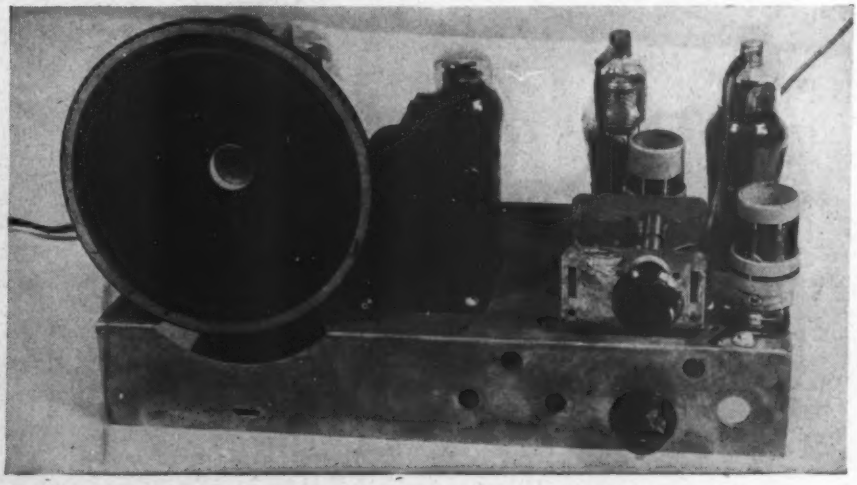
Diagram of connections for victory four-tube T.R.F. receiver

"bugs" encountered in so-called simple receivers. It is also designed to be used for making various tests and measurements for a practical course in radio servicing. This is accomplished by building the receiver and getting it to work and then substituting defective parts and making the necessary measurements to determine what effect the defective part or parts have on the receiver. The circuit as shown in the diagram uses a 6D6 tube as a screen grid RF amplifier. A 6C6 tube is used as an infinite impedance detector since this type of detector actually adds considerable amplification to the signal as well as performing its regular duty of rectifying the RF voltage. A 42 tube as a power amplifier further amplifies the audio signal so as to have enough power to drive a speaker. An 80 tube, which rectifies high voltage a.c., supplies the B voltage for the receiver.

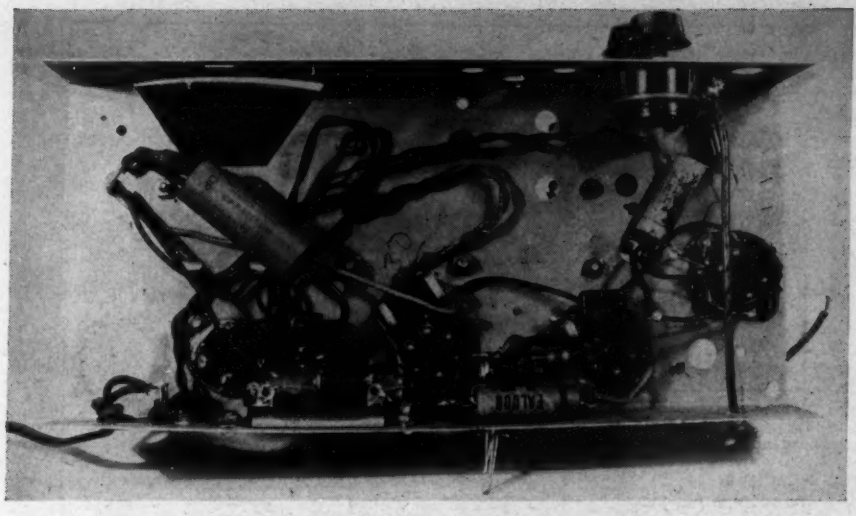
The parts for the receiver may be all new parts, if available, or may be salvaged from old receivers. If a power supply is available such as *"The Universal Power Supply"* described by the author on pages 65–68 in the February, 1944, issue of this magazine, the power transformer and the 80 tube may be eliminated from the receiver. To connect the power supply to the receiver connect B plus to the filament of the 82, and B minus to the center tap of the high-voltage winding. The filament voltage is connected to the chassis of the receiver and to the other side of the filament winding of the transformer. These connections refer to the diagram but in the construction of the receiver the power transformer will be omitted.

In the construction of the receiver it is necessary to assemble the parts that are mounted on the chassis first. If a blank chassis is used it will be necessary to drill it for the various parts such as tube sockets, etc. If salvaged parts are used they should be tested to make sure that they are in working order before installation is made. The filament circuit and the other a.c. circuits should be wired first so as to get the leads on the bottom of the chassis to prevent the other parts from picking up 60-cycle hum. It is necessary to keep all the grid leads as short as possible to keep the set from going into oscillation and from picking up hum from the a.c. leads. When wiring the filter condensers be sure to watch the polarity of these condensers; they will be marked on the case of the condenser or in most condensers the red lead will be positive and the black lead negative. If this condenser is salvaged from an old receiver be sure to notice which terminals are connected to the positive and negative leads in the old receiver.

Upon completing the wiring of the receiver, carefully check same with the diagram as this will save many hours of work later and will prevent the possibility of burning out parts because of incorrect connections. When the receiver is completely wired and checked, connect it to an a.c. line and a good outside antenna. One should be able to tune in several of the stronger stations. To get the receiver to operate properly one adjustment is necessary: tune in a station around 1400 kc. (the tuning condenser will be almost wide open); turn the volume down so the station can just be heard and adjust the two trimmer condensers on the variable condenser for maximum volume. If this receiver is connected to a good outside antenna reception of fairly distant stations may be expected.



Top view of victory T.R.F. receiver



Underside view of victory T.R.F. receiver

Parts List:

Coils:
1 — Antenna coil
1 — RF coil

Condensers:
1 — 2 gang .000365 mfd. variable condenser
3 — .1 mfd. paper condenser 400 V
1 — .01 mfd. paper condenser 400 V
1 — .0005 mfd. mica condenser 1000 V
1 — .001 mfd. paper condenser 1000 V
2 — 8 mfd. electrolitic condenser 450 V

Resistors:
2 — 5000 r* ½ watt resistor
2 — .5 meg. r ½ watt resistor
1 — 10,000 r volume control with switch
1 — 200 r ½ watt resistor
1 — 25,000 r ½ watt resistor
1 — 500 r 2 watt resistor

Miscellaneous:
1 — Power transformer for four tube sets
1 — Speaker with output transformer
1 — Chassis
1 — A.c. cord and plug
3 — 6 prong tube sockets
1 — 4 prong tube sockets
2 — Grid caps
2 — Knobs
Miscellaneous hardware: wire, solder, bolts, nuts, solder lugs, etc.

*r equals ohms.

Tubes:
1 — 6 D 6
1 — 6 C 6
1 — 42
1 — 80

Other tubes that can be used:

6 D 6		6 C 6		42	
6.3 V	6 K 7*	6.3 V	6 J 7*	6.3 V	6F6*
	6 SK 7*		6 SJ 7*		6K6Gt
	6 S 7*		6 W 7*		6Y6G
	78		77		6V6Gt
					41
2.5 V	58	2.5 V	57	2.5 V	2A5
	35		24A		47
					45

80	
5 V	5Z4*
	5Y3Gt
	5Y4G
	5T4*
	5V4G
	5W4Gt

*Metal tubes Gt or G tubes can be used also as shown. *Note* that these tubes are grouped by filament voltage.

BEAT THE AXIS — A SIMPLE PUZZLE

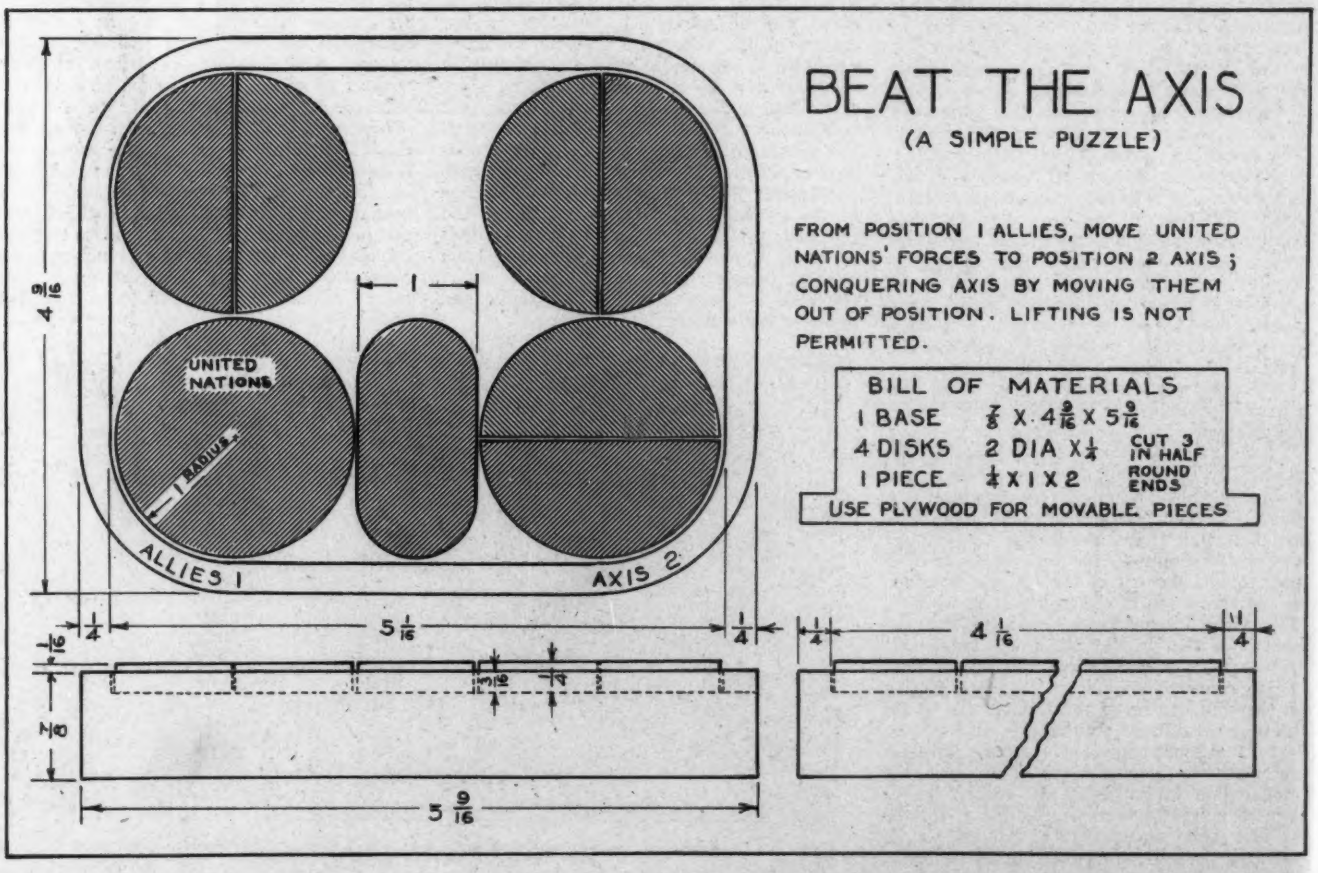
ISADORE M. FENN

Chicago Vocational School

Chicago, Ill.

The puzzle described herewith permits the introduction of many valuable shop experiences. Students take great delight in constructing this puzzle.

Instructors welcome this project because it offers worth-while technical experiences and information comparable to many larger projects and greatly aids the war effort in fostering the conservation of lumber and fasteners.


BEAT THE AXIS
(A SIMPLE PUZZLE)
FROM POSITION 1 ALLIES, MOVE UNITED NATIONS' FORCES TO POSITION 2 AXIS; CONQUERING AXIS BY MOVING THEM OUT OF POSITION. LIFTING IS NOT PERMITTED.
BILL OF MATERIALS
1 BASE 7/8 X 4 9/16 X 5 9/16
4 DISKS 2 DIA X 1/4 CUT 3 IN HALF
1 PIECE 1/4 X 1 X 2 ROUND ENDS
USE PLYWOOD FOR MOVABLE PIECES
UNITED NATIONS
1" RADIUS
ALLIES 1
AXIS 2
1
4 9/16
5 1/16
1/4
4 1/16
5 9/16

Procedure:

1. Study the blueprint. Make sure you understand it.
2. Obtain the required material. Use scraps and glue them together.
3. Make a layout for the base.
4. Square the base material to the proper dimensions and shape.
5. Chisel and gouge the surface of the base to the specified depth.
6. Make a layout for the movable pieces on scraps of plywood. Cut them out and sand.
7. Finish with shellac, clear lacquer, or use colors if preferred.
8. Then "Beat the Axis." *Lifting movable pieces is not permitted.*

Experiences and information acquired:

1. Blueprint reading
2. Gluing
3. Layout
4. Sawing
5. Squaring
6. Chiseling
7. Gouging
8. Sanding
9. Finishing

WHITTLING-JACKKNIFE TECHNIQUE

W. BEN. HUNT

Hales Corners, Wis.

(*Continued from page 242 of the June, 1944, issue*)

Sailfish

This project would look particularly fine if it were illustrated in color. Since that is not feasible, the author will try to describe it as closely as possible. Trace the side view shown in Figure 149 onto a piece of wood, being careful to have the grain running in the same direction as the beak, which is rather thin. If desired, the beak and the back fin, or sail, can be set into the fish by drilling a hole for the beak and a slot or groove for the fin. The one shown was whittled out of one piece. After cutting out the silhouette, Figure 150, draw a center line down the back, because the fish is not centered, but swings to one side at the tail end. Then block out the fish and waves as shown. While not much liberty can be taken with the beak, the large fin may be made almost ¼ in. thick at the base. It tapers toward the outer edge and the front and the rear, and the thickness of the base is not noticeable. The large fin requires the most work. After shaping, make V cuts as shown in the drawing. Photographs of sailfish show us that no two *sails* are alike so

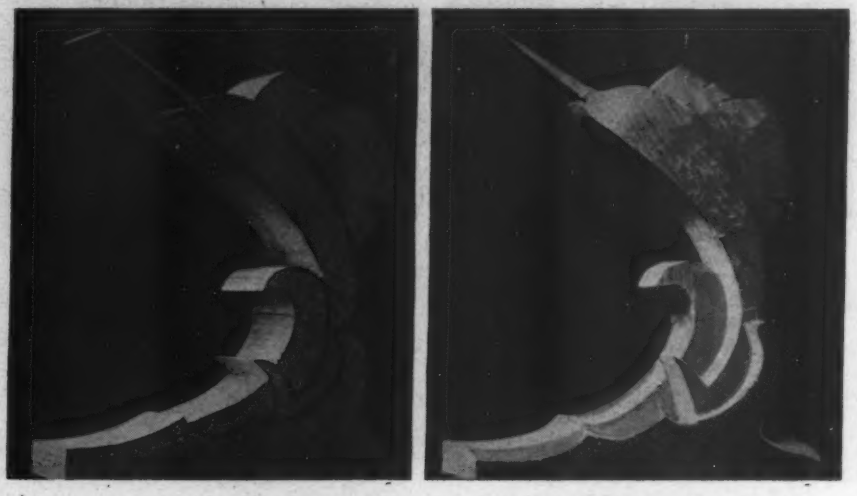


Fig. 150. The silhouette and blockout of the sailfish

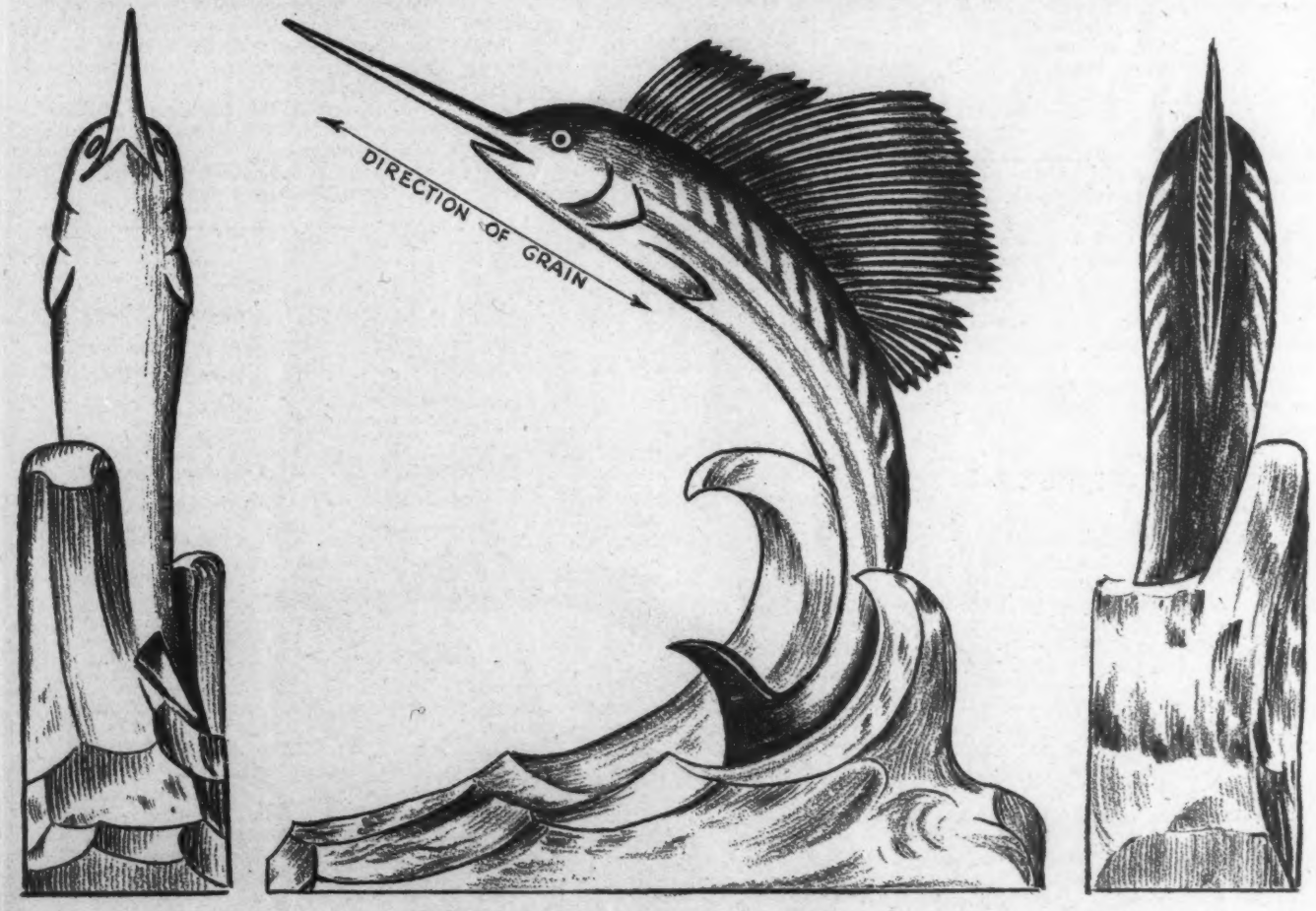


Fig. 149. Full-size pattern of sailfish

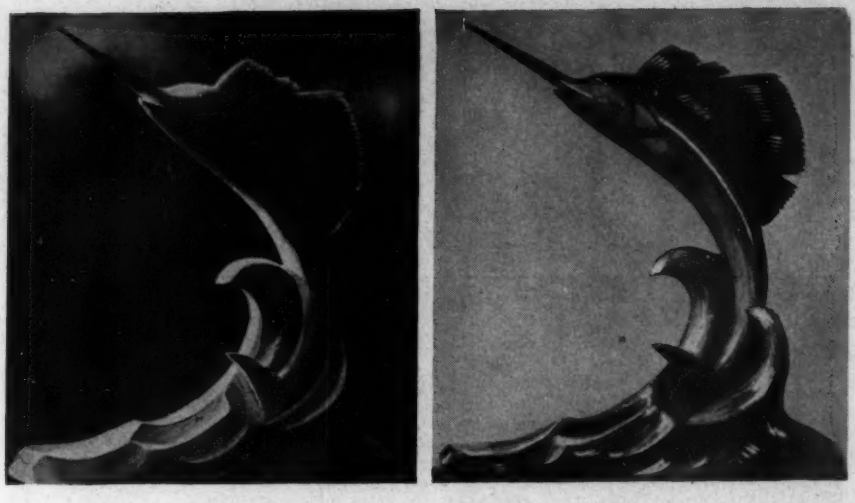


Fig. 151. The sanded and finished sailfish

you need not be too fussy. The other side of the fin can be left smooth. Carving the fish is not as difficult as the waves. A crooked knife comes in handy for carving these. If you have one, use it; if not, leave the wave surfaces flat. Everything can then be carefully sanded. Figure 151 shows the sanded sailfish and if you wish you can leave it at this stage or it can be stained and varnished, or it can be painted with water colors, as shown. If a colored picture can be had, of course, it will be much easier to follow. The back of this fish is a dark Prussian blue, almost black, which gets lighter as it goes down the sides. Then there is a white streak followed by a light blue streak. The light blue is made by mixing Chinese white with the Prussian blue. The light spots along the upper sides are also light blue. The eyes are orange with black pupils and the mouth and edges of the gills are a deep pink. The lower fins are tinted with pink and a touch of yellow. The belly is white with a streak of light gray down the center. The tail is black.

Paint the water a sort of lettuce green with bluish shading and white streaks here and there to denote foam. The fin is a medium blue with white streaks and black edges.

When the water colors have dried give the entire piece about four coats of lacquer (clear nail polish).

EXERCISE ON THE CIRCLE

ARTHUR W. WALZ
Lane Technical High School
Chicago, Ill.

1. Give the correct name for the distance around the circle shown at A. .....

2. What is the name of the point in the circle B? .....

3. State the proper term for the straight line in circle C. .....

4. What is the name of the straight line shown in circle D? .....

5. Write the word which will correctly name the space inside circle E. .....

6. What term is used to describe a part of the line drawn about F? .....

7. Give the name of a straight line that touches a circle at one point as shown at G? .....

8. If the straight line in circle H is one inch long, what is the distance around the circle? .....

9. How many times will the short line in circle I fit into the long one? .....

10. If you were given the length of the straight line shown in circle J, by what number would you multiply it to get the distance around the circle? .....

The man who graduates today and stops learning tomorrow is uneducated the day after. — *W.P.T. News,* Baltimore, Md.

GRADUATING DEVICE FOR THE METAL SHAPER

ROBERT T. STONER
Principal
Pennsylvania State School of Aeronautics
Harrisburg, Pa.

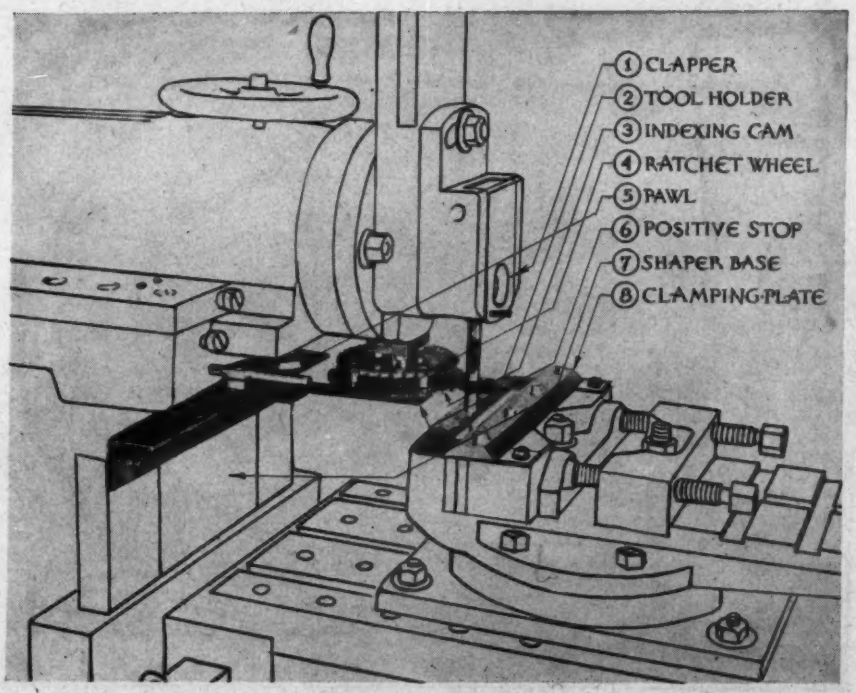
This simple attachment for the metal shaper will enable the school shop to accurately and rapidly graduate metal parts. Ray DeWalt, senior instructor of the machine shop, conceived and constructed this device for the production of 6-in. steel scales needed in war-production training and was able to reach an output of twenty scales per hour.

Every school machine shop can make this attachment as a shop project and enable each trainee to make his own steel scale or other graduated tool, singly or in quantity production. The usefulness of this device as well as the fascination associated with its method of manufacture meets the first element of good teaching — motivation.

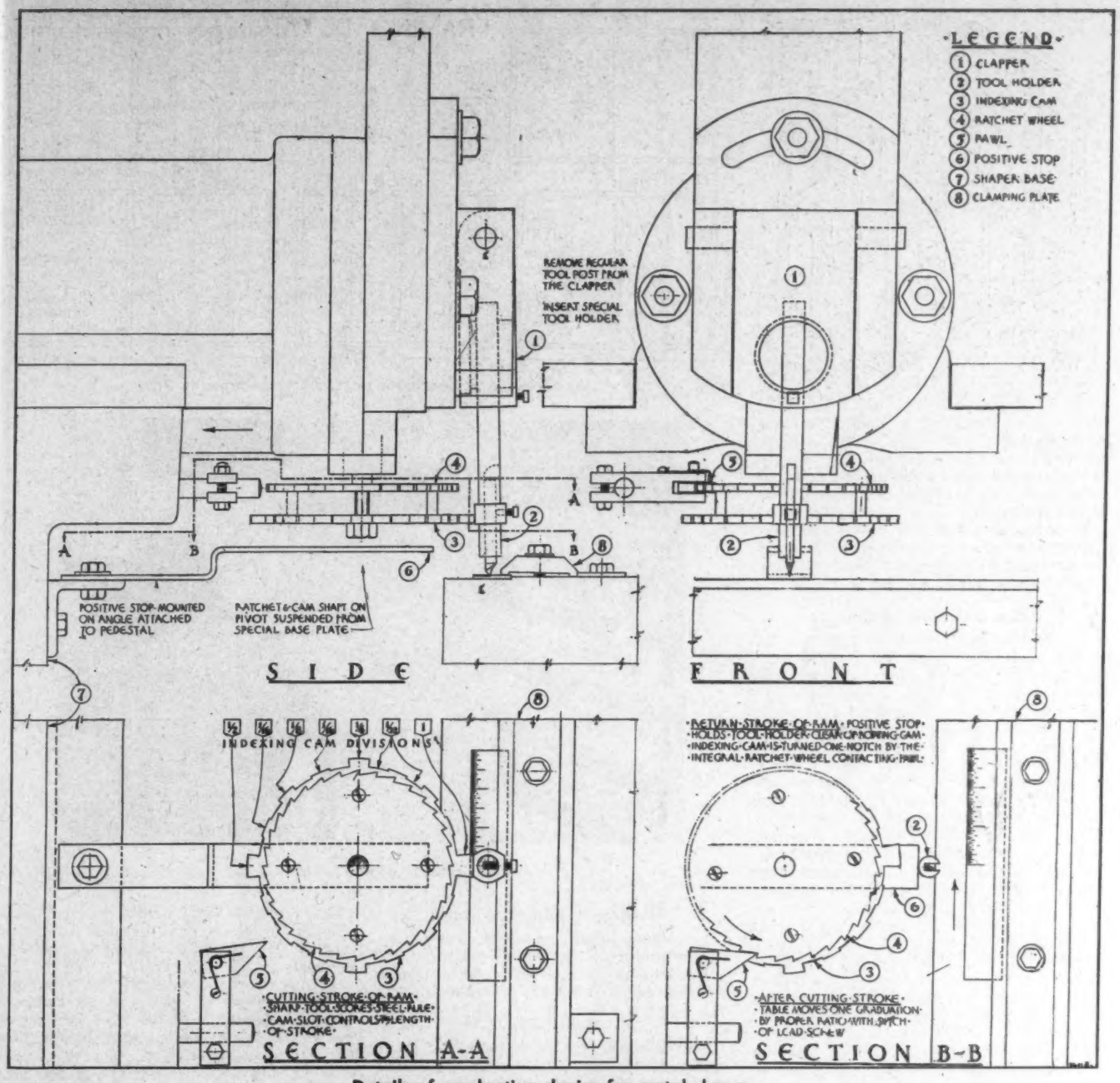
The principle of operation is simply one of moving the cutting tool forward for varying lengths as specified for the scale; this is made possible by the design of the indexing cam. The distance between graduations depends upon the lateral movement of the shaper table between tool strokes which is made possible by the lead screw feed and the positive tool stop.

The first problem of manufacture involves its adaptation to the type and size metal shaper to which it will be attached. The following notes and illustrations present the design and details of operation. It will be necessary to make a detailed working drawing for each particular shaper in consideration of the following:

A. Determine the number of graduations needed per inch for layout of the indexing cam, the diameter of which is determined by the space available under the ram and the spacing on the ratchet wheel.



Graduating device for metal shaper


LEGEND
1 CLAPPER
2 TOOL HOLDER
3 INDEXING CAM
4 RATCHET WHEEL
5 PAWL
6 POSITIVE STOP
7 SHAPER BASE
8 CLAMPING PLATE
REMOVE REGULAR TOOL POST FROM THE CLAPPER
INSERT SPECIAL TOOL HOLDER
POSITIVE STOP MOUNTED ON ANGLE ATTACHED TO PEDESTAL
RATCHET & CAM SHAFT ON PIVOT SUSPENDED FROM SPECIAL BASE PLATE
SIDE
FRONT
INDEXING CAM DIVISIONS
CUTTING STROKE OF RAM · SHARP TOOL STOKES STEEL RULE · CAM SLOT CONTROLS LENGTH OF STROKE ·
SECTION A-A
RETURN STROKE OF RAM · POSITIVE STOP · HOLDS TOOL HOLDER CLEAR OF INDEXING CAM · INDEXING CAM IS TURNED ONE NOTCH BY THE INTEGRAL RATCHET WHEEL CONTACTING PAWL ·
AFTER CUTTING STROKE · TABLE MOVES ONE GRADUATION BY PROPER RATIO WITH SWITCH OF LEAD SCREW
SECTION B-B

Details of graduating device for metal shaper

B. Determine the pitch of the shaper lead screw and the fractional revolution needed to move the table laterally 1/32 in. If the lead screw is 8 pitch, giving ⅛-in. lateral movement to the table per revolution, then to move 1/32 in. in graduating will require a quarter revolution of the lead screw which is controlled by the ratchet pawl. Bear in mind that the pawl must engage the screw when the ram is on the back stroke.

C. It is necessary to disengage the toolholder from the steps in the index cam while the cam is being rotated by the returning stroke of the shaper ram. This disengagement is made possible by the positive stop which engages the toolholder on the back stroke.

D. The cutting point of the tool should be on the perpendicular line from the center of the clapper box pin to prevent an arc in graduation and variable depths in the graduation cuts.

Here is a project which will challenge the technical knowledge and mechanical skill of the advanced machine shop student. When he has solved the problems connected with its proper design and machined the necessary parts for attachment to the shaper he will have that glow of satisfaction which results from outstanding achievement.

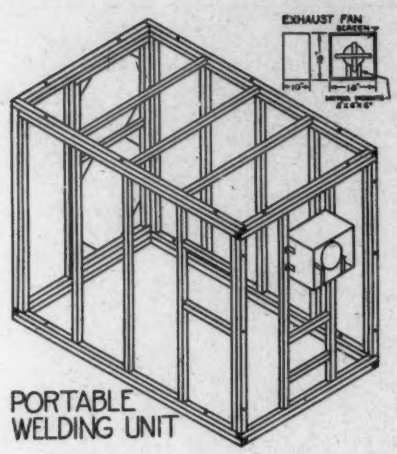
A PORTABLE WELDING UNIT

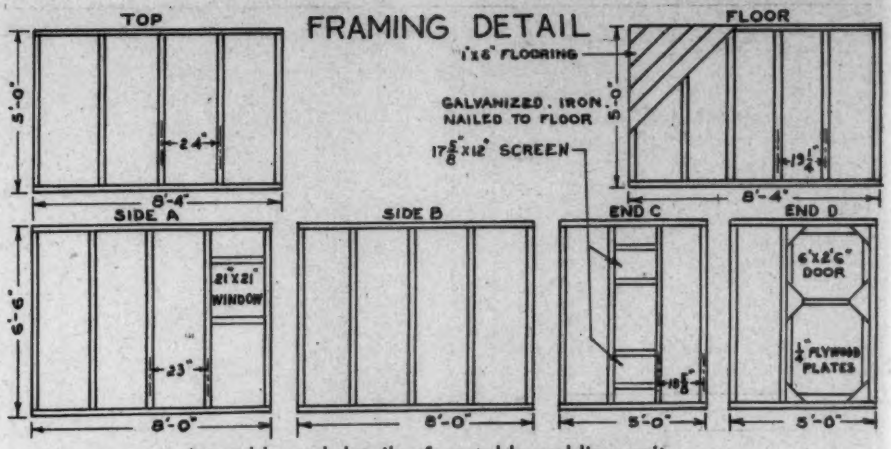
LELAND G. STROMBOM
Sycamore Community High School
Sycamore, Ill.

The physical features of our industrial-arts plant at Sycamore Community High School presented some outstanding problems, to be solved before insurance companies would sanction installation of an oxyacetylene welding unit in our school shop. Their ruling was based on the following points:

1. Our shop had a wooden floor.
2. We lacked a proper air exhaust system.
3. The shop was located on the first floor in the center of the building.
4. Our metals area was immediately adjacent to our woodworking area.

In the opinion of the insurance company representatives, the board of education, and the school administration, the previously mentioned points constituted an extreme fire hazard. However, everyone was in favor of the proposed welding unit and instructed the author to formulate plans, so that the unit could be added to our course of study.





Assembly and details of portable welding unit

Several conferences were held with insurance representatives and as a result definite conclusions were reached, as far as materials and ventilation were concerned. The interior of the structure housing the welding unit had to be entirely fireproof and, in addition, have proper ventilation.

Immediately, plans were drawn and construction started on a welding unit that could be moved if necessary and still was large enough to take care of the unit.

General Plan of Unit

The housing unit consists of 2 by 2-in. fir framing stock, butted and nailed at all joints with 16^{d} nails. To this frame is nailed asbestos wallboard. In nailing these to the frame one can shift the pieces around so that small pieces can be utilized. Carriage bolts are used to secure the top, sides, and ends together. They are installed in places where strength is needed. If the unit has to be moved through a doorway it can be disassembled by removing the bolts. It can be moved from one part of the shop to another by sliding. Galvanized iron sheets are nailed to the floor with 4^{d} nails. In order to provide adequate ventilation an exhaust system was improvised. Two openings on one end provide for circulation. These are covered with screen. The exhaust fan is made by mounting an automobile fan to a ¼ horsepower motor. The pitch of the blades on the fan are reversed to produce a pulling effect. This fan unit is mounted in a wooden duct, which can be connected to the outside; however if the unit is close to a window this will suffice. Opposite the welding table a window is inserted so that the worker can be observed from the outside. This window is painted with a thin coat of flat, green paint to prevent glare. A ceiling light fixture of the kitchen type provides adequate light. A lock on the door keeps the equipment in good order when not in use. Two coats of paint were applied to the unit to improve the appearance.

Equipment Constructed for Unit

7 — Sheet-metal shelves for filler rods and fluxes.

1 — Welding table of an angle iron and firebrick construction.

1 — Angle-iron shelf for mounting C clamps.

1 — Panel for holding all welding accessories, such as tips, wrenches, goggles, and igniters.

1 — Chain support to keep oxygen and acetylene tanks supported rigidly.

1 — Bracket on which to hang the hose.

The interior of the welding unit

Equipment Added to Unit

1 — Metal trough containing instructions on the operation of the welding outfit.

1 — Natural color chart (under glass) showing the different types of welding flames.

Conclusion

This unit has been in operation for about a year. It has given our boys an opportunity to learn a few basic fundamentals about oxyacetylene welding, and has served its purpose very well.

BICYCLE MAINTENANCE AND REPAIR

FRED FINSTERBACH

Buffalo, N. Y.

The repair and maintenance of bicycles is an activity close to the life of the average high school student. The resurgent interest in cycling as a means for transportation, for healthful exercise, and for recreation, has brought about the necessity for some planned instruction in the care and repair of these vehicles..

Representing as it does a somewhat major investment for the average family, the bicycle merits more consideration than it usually gets. This is especially so during wartime conditions when skilled repairmen, replacement parts, and supplies are virtually nonexistent or carefully rationed.

It is an obvious inconsistency for the industrial-arts courses to offer work of abstract or remote benefit, if at the same time those interests closest to the students' present life are ignored or neglected.

While many alert instructors permit and encourage bicycle repair, it is often intermittent and extra, rather than part of a planned course.

It is felt that special planning with tools, initial equipment, and necessary aids will provide continual stimulus and the means for a substantial unit of work in bicycle maintenance and repair.

The objectives of such a course would be in harmony with any educational philosophy which recognizes the dynamic nature of our modern industrial civilization. They should certainly direct a course which would fit the needs and ability of the teen age boy and girl.

Objectives

1. To aid students to learn the functional repair and maintenance of the bicycle.

2. To increase the students' appreciation of the bicycle as a means of transportation,

healthful recreation, and, of learning the application of mechanical principles.

3. To increase the students' ability to select and evaluate different kinds of bicycles and accessories.

4. To contribute to the economy of the home by conserving and lengthening the life of the bicycle.

5. To provide the opportunity for teaching applicable rules for the safe use of the bicycle.

The related work involves those *cultural aspects* which make no particular mechanical contribution but which stimulate appreciation, extend enjoyment, and satisfy the human thirst for knowledge above and beyond the bare functional necessities.

Equipment

The following list of equipment provides for a complete unit including workbench, vise, stands, tools, accessories, and appliances. Much of the equipment can be acquired secondhand. Many items can be built in the school shop.

The more self contained the unit is made, the less will be the managerial difficulties. Furthermore, the continual stimulus provided by the well-organized unit is of inestimable value.

Catalog numbers and approximate prices are Sears-Roebuck 1942–43 and are given for identification purposes only. Other parts may be substituted as desired. When new equipment is purchased, it must be remembered that consumer judgments and discriminatory abilities can best be developed by the inclusion of similar items representing competitive manufacturers.

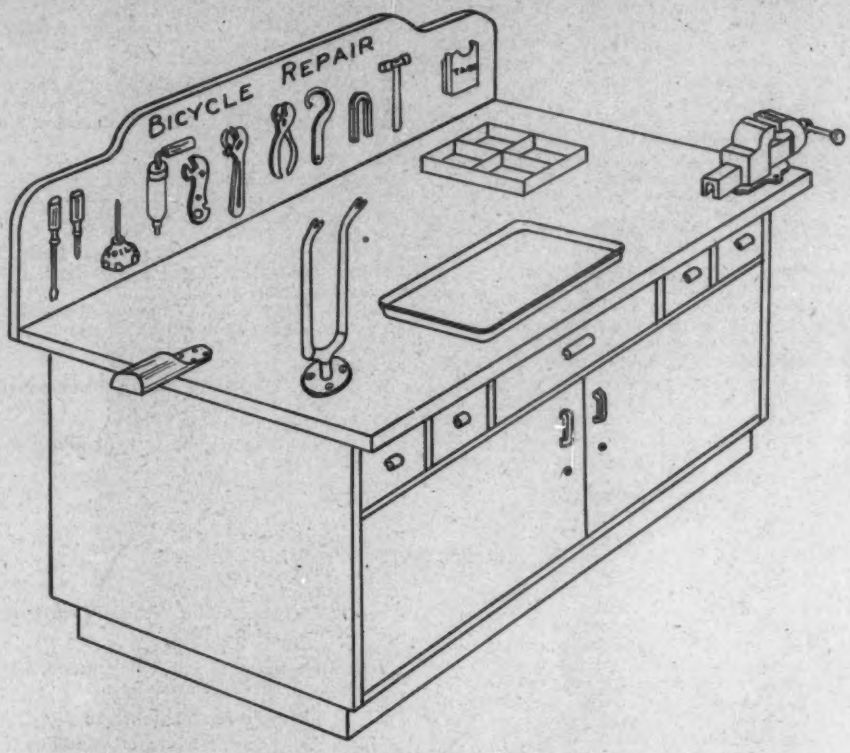


Fig. 1. Bicycle maintenance workbench

6. To provide means for the exercise of fundamental skills in the use of common industrial tools, machines, and materials.

7. To provide exploration and guidance pertaining to bicycle manufacturing or repairing as a vocation.

How to Use the Course

The course is designed to permit the nonowner of a bicycle to participate in the work by performing some of the operations listed or by assisting an owner to recondition or repair a bicycle. The course will best function, however, by providing the bicycle *owner* with tools, expert instruction, and supervision for maintenance or repair of his vehicle.

The course is divided into: operations; tests and measurements; projects; and related work.

The operations consist of *things to be done to the bicycle* in order to repair damage, to make adjustments, and to maintain the vehicle in good condition.

The tests and measurement section concerns the *formation of judgments* by the performance of comparative examinations, trials, and tests of the various parts. This emphasizes a function of industrial arts hitherto ignored.

The projects cover *appliances and devices which can be made* by the students to increase the usefulness, or to facilitate the repair and maintenance of the bicycle.

Equipment

Items		*Approx. Cost*
1 Workbench — with tool panel, machinist's vise, drawer and storage space		$50.00
1 18-in. boy's bicycle—standard model—complete with front and rear fender, rear parking stand, coaster brake, roller chain, balloon tires, double bar frame		30.00
Accessories		
1 2-speed gearshift outfit — Elgin or Equal	6K5477	$5.00
1 Luggage carrier with 1-cell taillight	6K5340	1.25
1 Combination set, horn and light	6K5467	1.80
1 Torpedo headlight	6K5444	.50
1 Rear view mirror	6K5457	.40
1 Flashlight bracket	6K5445	.10
1 Side kickup stand — plated	6K5436	.60
1 Bike compass	6K5463	1.25
1 Speedometer	6K5374	2.75
1 Cyclometer for 26-in. wheel	6K5399	1.00
1 Generator and light set	6K5348	2.75
1 Double chime bell	6K5321	.30
1 Siren horn	6K5317	1.00
1 Chain guard	6K5370	.35
1 Fender flap	6K5413	.25
1 Reflector	6K5459	2.00
1 Front wheel rim brake		2.00
Parts		
1 New Departure coaster brake, model C	6K5292	$3.00
1 Morrow coaster brake	6K5294	3.00
1 Elgin coaster brake	6K5407	3.00
1 Cartridge unit—Elgin brake	6K5408	1.00
1 Set — brake disks New Departure, model C	6K5449	.50
1 Cartridge unit—Morrow brake	6K5450	1.60
1 Pedal repair couplings, right and left	6K5320	.30
1 Roller chain 3/16 by 1 in. pitch	6K5405	.75
1 Front wheel hub, 36—spoke holes with cones, nuts, and axle		$ .65
3 Roller chain repair links	6K5344	.25
1 Front axle — universal — with cones and nuts	6K5443	.05
1 Doz. each size—spokes and nipples, 9 9/16, 10½, 11, 12		.60
2 All-purpose bicycle wrenches	6K5377	.25
2 Spoke nipple grips	6K5381	.10
1 Each, hand grips 6K5468, 6K5357, 6K5473,	6K5474	.60
1 Front fork — plain, for 26 in. balloon tire	6K5422	1.25
1 Set fenders — front and back for 26 in. tires	6K05432	1.00
1 Crank repair set	6K5442	1.60
1 Set right and left pedals — adjustable	6K5346	.70
1 Stem	6K5329	.75
1 Handle bars	6K54111	1.00
1 Tire pump	6K5383	.75
1 25-in. front wheel balloon tire rim, complete with spokes and hub	6K05238	2.25
1 Box valve insides		.15
1 Box valve caps — straight stems		.15
1 8-in. crescent wrench		.60
1 Set open end wrenches 3/8 to 1 in.		2.25
1 Pr. thin nose slip joint pliers		.50
1 6-in. screw driver — common		.50
1 4-in. screw driver — Phillips screws — No. 1		.50
1 Balloon tire and tube — heavy duty — 26 in.		2.25
1 Soft face hammer — Stanley No. 594		1.50
1 Bumping dolly — general purpose — Stanley No. 616		.90
1 Set hand punches—Stanley No. 6B — 4/32, 5/32, 6/32		.90
Supplies		
1 Each, bicycle enamel, black, cherry red, royal blue, ivory, in ¼-pt. cans	6K5396	$ .80
2 Tubes, puncture—seal fluid	6K5378	.15
2 Tubes, rim cement	6K5389	.10
1 Vulcanizing outfit	28K1037	.50
1 Cold patch tire repair kit		.25
1 Can chrome polish		.75
1 Can chrome paint, ¼-pt. can		.35

3	Brushes 1 in. — rubber set	.80
2	Lbs. steel wool — No. 2/0	.36
1	Quire emery cloth—No. 1	.60
1	Quire emery cloth—No. 0	.60
1	Quire wet or dry sandpaper—No. 4/0	.75
2	Gasoline brushes — Osborn No. 179	1.00
1	Doz. round marking brushes No. 2 — 3/12 diameter	.65
1	Roll ½ in. — masking tape	.50

Operations

Adjust handle bars
Adjust stem
Adjust seat and post for comfort
Take off and replace front wheel
Take off and replace rear wheel
Adjust chain tension
Lubricate whole bicycle
Oil and adjust bell
Take apart, grease, and assemble crank
Grease rear hub
Grease front hub
Remove low-pressure tire
Repair punctured tube
Replace low-pressure tire
Repair high-pressure tire
Replace batteries in light
Recement hand grip in place
Attach chain guard
Adjust pedals
Attach pedal couplings
Attach rear parking stand
Mount reflector on rear fender
Install taillight
Attach side kickup stand
Install generator and headlight
Attach a speedometer
Attach a cyclometer
Take apart and clean front hub
Take apart and clean coaster brake
Apply repair links to chain
Change sprocket on rear wheel
Install a siren horn
Replace broken spoke
Lace spokes in a wheel
Realign bent wheel
Replace bulb in light
Disassemble and tag bike parts for refinishing
Condition frame for refinishing
Condition fenders for refinishing
Condition wheel rim for refinishing
Attach rear luggage carrier
Attach wire basket on handle bars
Reassemble parts on a new frame
Realign a bent frame
"Bump out" a damaged fender

Projects (to make)

An owner's name plate for bicycle
A side kickup stand for bicycle
A luggage carrier for bicycle
A rear parking stand for bicycle
Turned wood or plastic grips for bicycle
Painting stand for frame of bicycle
A stand for wheel repair
A painting stand for fenders
Boxes for parts
Tags for parts
A tail reflector
A headlight
A taillight
A battery carrying case
A trailer for bicycle
Conversion parts for tandem bicycles
Conversion parts for delivery bike with two rear wheels
Conversion parts for bicycle side car
Parking rack for school bicycles
Parking rack for family bicycles
Stands for various testing equipment
Stands for use of bicycle as stationary exerciser
Conversion parts for a unicycle

Tests (to conduct)

Strength tests for various makes of chains
Traction tests for different types of tire treads
Braking tests for conventional coaster brakes
Exposure tests for various kinds and colors of bike enamels
Length-of-life tests for various battery cells
Vibration tests for fenders, fasteners, lights, horns, etc.
Power comparison tests for different sprocket arrangements

Measurements (to determine)

Stopping distances at different speeds
Strength and weight relation of different types of frames
Advantages and disadvantages of balloon and hi-pressure tires
Relative comfort of various types of saddles
Effect of center-of-gravity changes
Relative values of natural and synthetic rubber tires and tubes
Comparative strength of different types of bicycle tubing and parts
Adjustment standards for bearing and fittings
Comparison data for leading makes of bicycles
Measurements of caloric energy used in cycling
Muscles developed by use of bicycle
Effect of air pressure on life of tires

Related Topics

Heat-treatment applied to bicycle parts
Alloys used in bicycle part manufacture
Plating of bicycle parts
Rustproof treatments as applied to bicycles
Color harmony as applied to finishing of bicycles
Air-flow design as applied to bicycles
How the 2-speed gearshift works on bicycles
Effect of caster on front wheel
Safety precautions for operation of bicycle
Trades represented in bicycle manufacture
Geographical sources for materials used in the bicycle
Evolution of the bicycle
Speed records and outstanding cyclists
Biography of leading bicycle inventors or manufacturers
Economic value of the bicycle as a means of transportation
Laws of physics as applied to the bicycle
Chemistry of synthetic rubber used in bicycle tires
Standard tire sizes, frame measurement, and thread sizes used in conventional bicycles
Elements of saddle design for bicycles
Elements of structural design for frames of bicycles
Elements of decorative design for bicycles
Elements of handle-bar design for bicycles
Elements of design for luggage and package carriers on bicycles
Elements of design for pedals of bicycle
Elements of design applied to hand grips of bicycles

The workbench shown in Figure 1 is planned with toe space to facilitate close work. It is built to the floor, completely enclosed to utilize space and to make maintenance easier. The top should be from 1¼ to 2 in. in thickness. Drawers should be long enough to accommodate spokes and to contain small parts and supplies. The cupboard area below the drawers is planned for the storage of parts and appliances.

The flat tray is for laying out greasy parts as they are disassembled. The partitioned box can be used for holding small parts.

On the tool panel, left to right, are shown a plain screw driver, a Phillips screw driver, an oiler, a grease gun, an all-purpose wrench, an adjustable end wrench, a pair of slip nose pliers, a spanner wrench, a magnet (for catching ball bearings), a soft face hammer, and a case for part tags. The curved board on left of bench is for tube repair. The forked stand, made from front wheel fork, is intended to facilitate wheel repair. The vise is an ordinary 3-in. jaw machinist's vise. The edges of the table, the toe space, and the edge of the tool panel could be colorfully accented.

Selected Reference Material

Historical Facts About the Bicycle
Short Riding and Inspection Test
Games to Be Played on a Bicycle
Cycle Transportation
Touring by Bicycle
Bicycling for Women
Selecting Your Bicycle
Source: Cycle Trades of America, 3510 Channin Bldg., New York.
Component Parts of a Bicycle — Page 155
D. P. Harris Hardware Catalog, New York
Ordinary Care of Bicycle
Mead Cycle Company, Chicago, Ill.
Instructions for Assembly and Disassembly of Morrow Coaster Brake
Eclipse Machine Division, Bendix Aviation, Elmira, N. Y.
English Bicycles
B.S.A. Cycles Ltd., Birmingham 11, England
Bikes for Girls and Boys
Lumbermans Mutual Casualty Company, Chicago, Ill.
Riding High (film)
How to Take Care of Your Bike
Shelby Service Manual
Shelby Cycle Company, Shelby, Ohio
The Care and Sale of Bicycles
Information Regarding the Musselman Brake
Murray-Ohio Mfg. Company, Cleveland, Ohio
Evolution of the Bicycle
Lobdell Emery Mfg. Company, Alma, Mich.
Bicycle Mechanics Course (job sheets)
Cleveland (Ohio) Plain Dealer
Bicycle Safety Tests
Ben Miller, Indiana University, Bloomingdale, Inc.
Bike Riders' Manual
Traffic Education Unit, Los Angeles Police Department
Analyzing Bicycle Accident Records
Defensive Cycling
Bike Safety Information Test
Sammy Sprocket Says
National Safety Council
As One Pilot to Another
Bicycling With Safety
Safety Division, Motor Vehicle Department, Madison, Wis.
Bicycle Safety
State Department of Public Instruction, Division of Health, Dover, Dela.

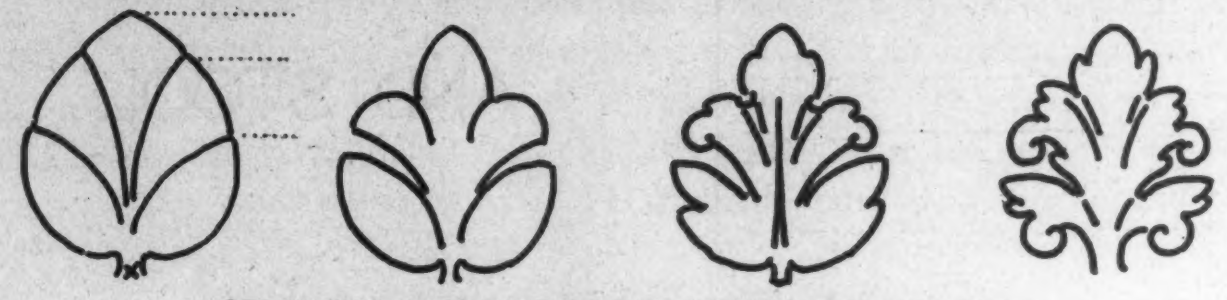
Bicycle Manufacturers

Listed in Thomas Register (1943 edition)

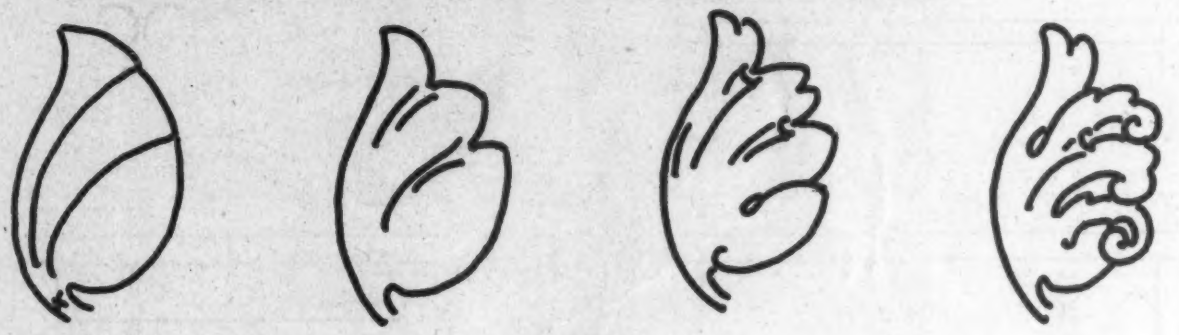
U. S. Spring & Bumper Co.
E. 50 & Magnolia, Los Angeles, Calif.
Motorized spring frame
Monark Silver King
1240 N. Homan, Chicago, Ill.
Excelsior Mfg. Co.
Michigan City, Ind.
Westfield Mfg. Co.
Westfield, Mass.
D. P. Harris Hardware Mfg. Co.
99 Chambers, New York, N. Y.
Cleveland Welding Co.
W. 117th & Berea Rd., Cleveland, Ohio
Huffman Mfg. Co.
Dayton, Ohio
Shelby Cycle Co.
Shelby, Ohio
American Motor Scoot Co.
816 W. Erie, Chicago, Ill.
Mead Cycle Co.
17 S. Market, Chicago, Ill.
W. A. Strohm & Bro.
1612 W. Lake Street, Chicago, Ill.
Johnson Iver Arms & Cycle Works
Fitchburg, Mass.
Homer P. Snyder Mfg. Co.
Little Falls, N. Y.
Uhlen Carriage Co.
416 St. Paul St., Rochester, N. Y.
Murray Ohio Mfg. Co.
1100 E. 152nd Street, Cleveland, Ohio
Colson Corporation
Elyria, Ohio
Hettrick Mfg. Co.
Toledo, Ohio

Education is the cornerstone, the foundation, the seed corn, of all established business. — *Robert L. Cooley.*

PLATE 23 NATURE



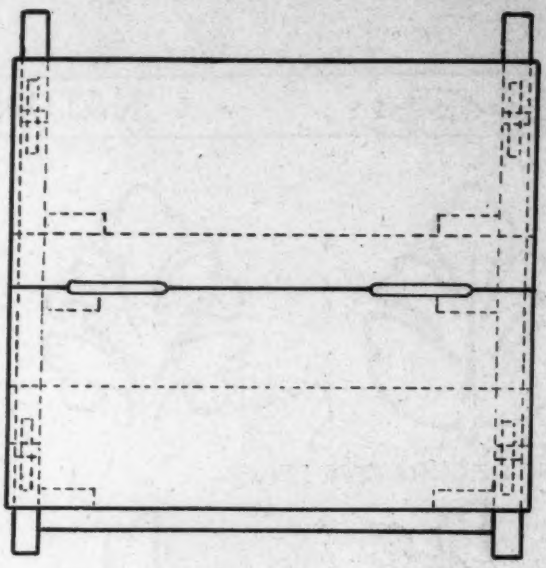
STEPS IN THE CONSTRUCTION OF A DECORATIVE LEAF

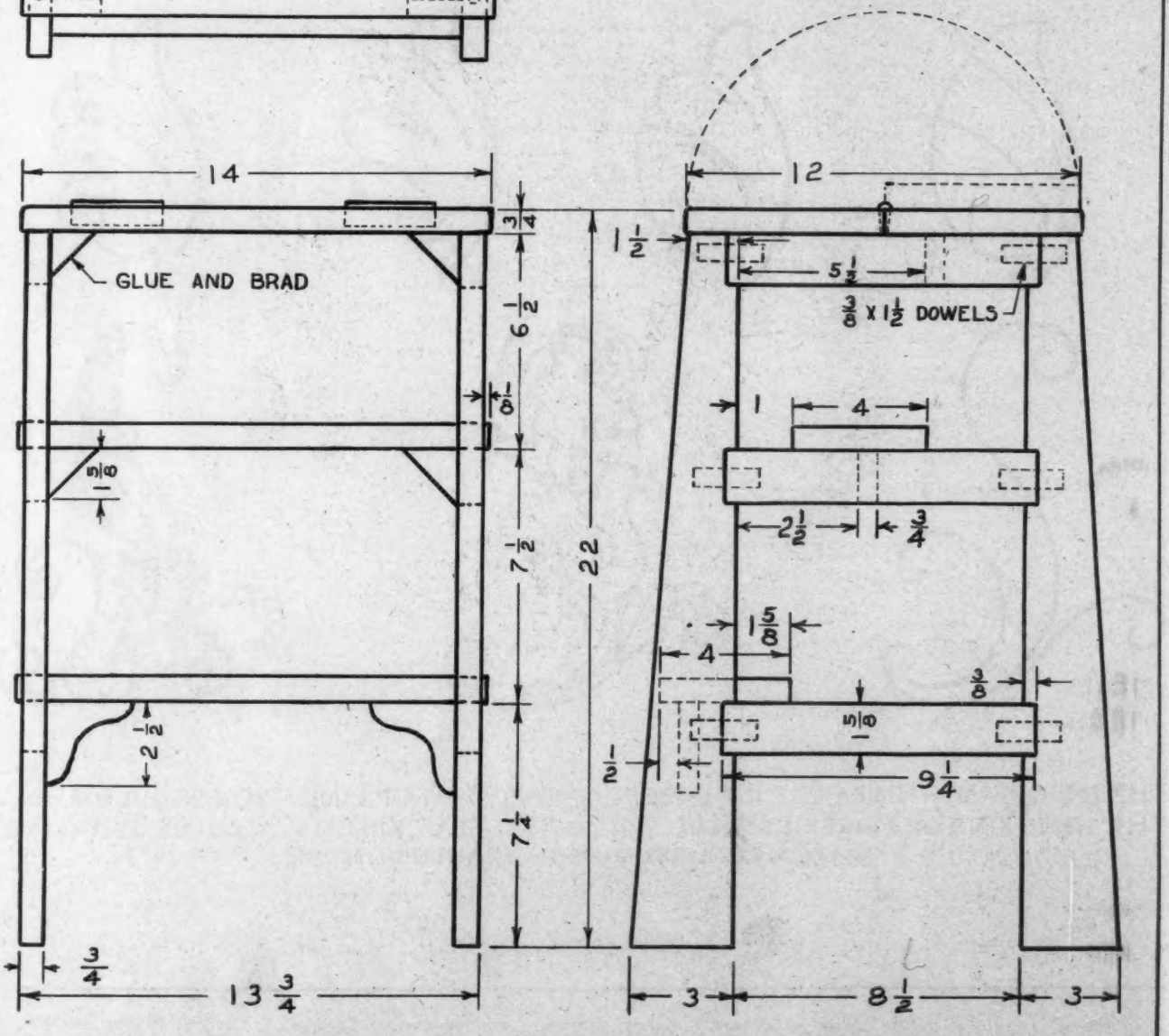


THE IMPORTANT THING HERE IS GRACEFUL MOVEMENT OF LINE • YOU SHOULD FEEL THE SAME KIND OF MOVEMENT AND SWING AS IS FELT WHEN WATCHING SWIRLING WATER OR LISTENING TO BEAUTIFUL MUSIC

Plate 23. Creative design course by Richard E. Bailey, chairman, art department, Central High School, Providence, R. I.

KITCHEN STEPS AND STOOL

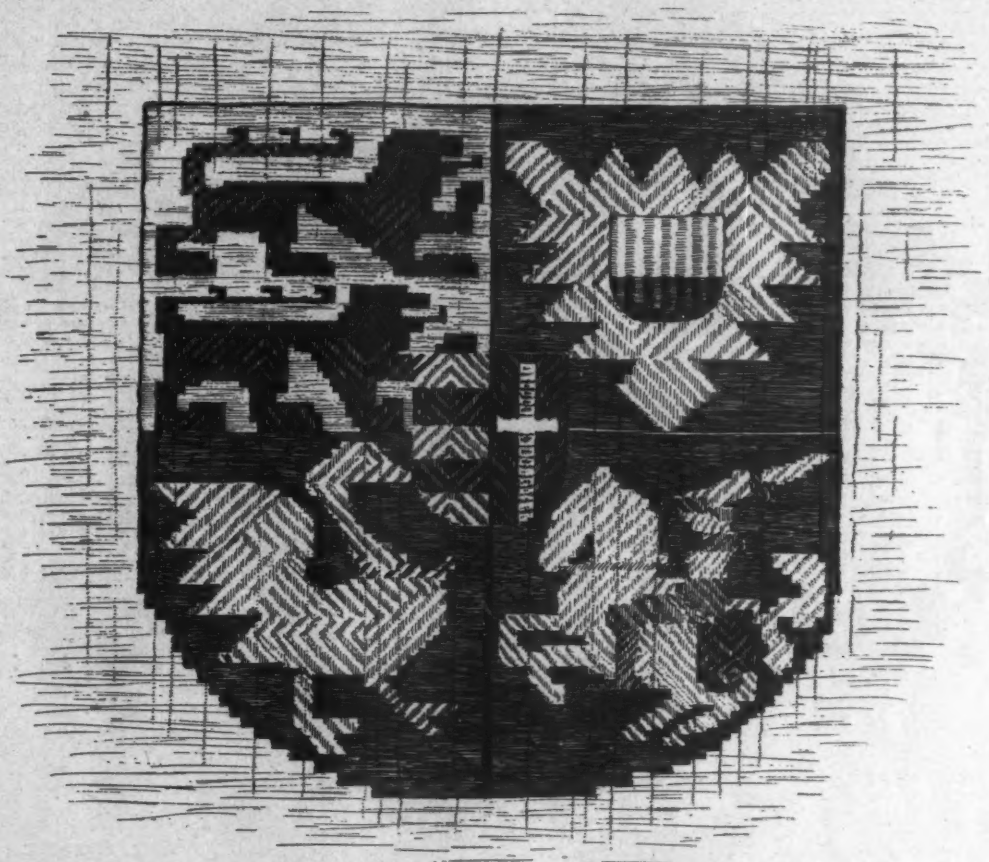




Kitchen stepladder designed by J. I. Sowers, supervisor of industrial education, Miami, Fla.

WHAT IS THE NATURE OF THE TAPESTRY WEAVE?

The tapestry weave is the freest, least mechanical of all the processes of weaving. Its gamut of types and possibilities extends from the very rigid and relatively simple geometric patterns of the Navajo to the ten-thousand-shade naturalistic masterpieces of the French Gobelins. The nature of the pattern and the technique of weaving, particularly the joining of color areas, are closely related, so technical understanding must precede designing.

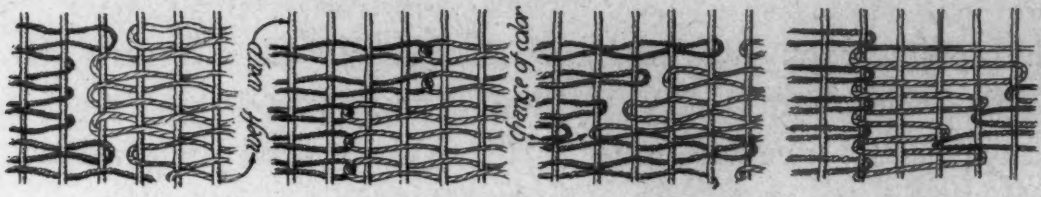


Portion of a Tapestry by Bertha Möller

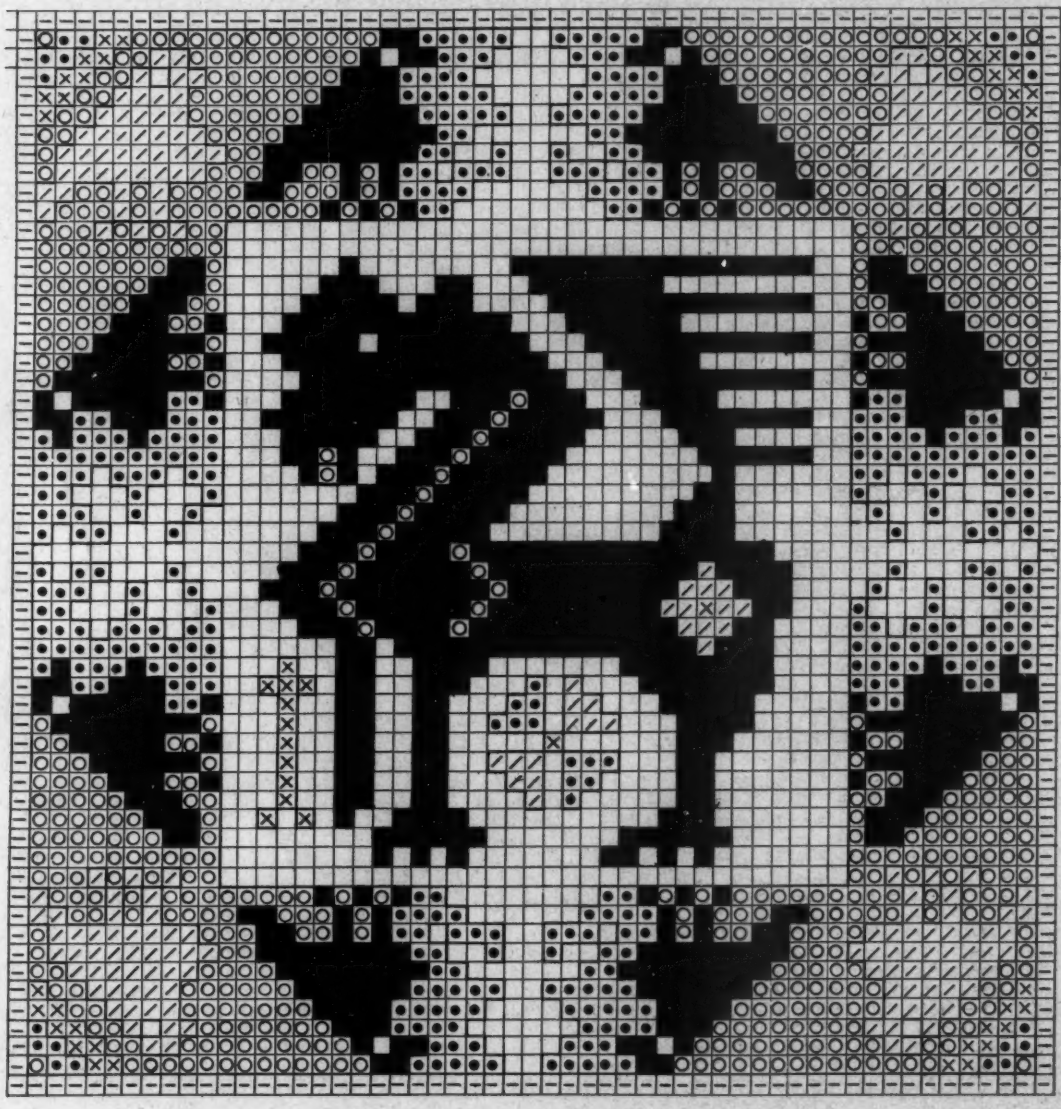
Since all such weaving is rectangular in structure there are no curves in the design. Areas are outlined by horizontal and vertical lines only. Oblique outlines move by steps, each of which is a multiple of the weft threads (vertical development), or of a variable number of warp threads (which will extend the pattern horizontally). These are counted in the pattern.

Plate 40. Design course by Burl N. Osburn, director of industrial arts, State Teachers College, Millersville, Pa.

TAPESTRY WEAVE (Continued)



Kilim Weave Norwegian Åklae Norwegian Lightning Weave Navajo Weave



Design for a Tapestry, Adapted from an Old Norwegian Pattern, by Elmer Wallace Hickman courtesy "The Weaver," published by Emile Bernat & Sons Company

Key: French Tapestry Wool – 108 warp threads 1 square = 2 warp threads ⊡ *Y. Red* ☑ *Olive Green* ⊡ *Y. Gold* ⊠ *Powder Blue* □ *Cream* ■ *Antique Black* ⊟ *Sage Green*

Colored pencils are used on squared paper to develop the color scheme.

Plate 41. Continuation of design course by Burl N. Osburn, director of industrial arts, State Teachers College, Millersville, Pa.

BOOKLETS MADE WITHOUT BENEFIT OF TYPE OR PRINTING PRESS

Lt. R. Randolph Karch, USNR

A presentable book page can be made sans type, sans printing presses, and without expensive line plates and half tones. Such work is indeed imitation printing, and cannot be compared with the quality of the letterpress process in general use today. How this work is done with an inexpensive outlay of money is the intent of this article. No great skill is required of the workers in this plan. Any good stenographer can make the reproduction proofs, and most persons with amateur experience in photography can do the plate-making with little practice. Small offset lithographic presses, usually called "duplicators," put the impressions on paper. The operation of these duplicators can be learned by any person of average intelligence in a short time. Bindery work and the cutting of paper stock is not so difficult, and men or women boasting a vocational printing course should be able to carry the booklets through to completion.

Advantages of the offset instructional booklet are:

1. Speed of completion.
2. Minimum of equipment expense.
3. Excellent results when compared with the usual stencil method of printing.
4. Confidential matter readily produced.
5. Utilization of nonskilled operators.
6. Use of equipment serving other purposes: typewriters, photographic equipment and offset lithographic duplicators.

Preparation of Copy

All proofs are typed on a specially lithographed sheet of regular bond paper covered with figures printed in a very light blue ink. This allows the exact positioning of all copy, which insures registration of pages as well as uniform size, uniform positioning of page numbers, and correct margins. See Figure 1. The following procedure is used:

1. Draw margins on the figured-background sheet with blue (non-photographic) pencil. All pages must be typed to a preconceived size. Never use black or red pencil because marks drawn by these tools will photograph, and all such lines must be painted out by hand by the photographers. Never use any color save blue, and draw all lines lightly. Determine all page sizes by line count for depth, and character count for width. Never use a ruler or the linear system for measurement because it does not coincide with typewriter spacing. See Figure 1.

2. Align the typewriter to the first line of blue figures. Take great care that all lines are aligned properly at the start. It is also necessary, because of paper slippage, to check each sixth line as the typing is done to see that all typing aligns with the blue figures. If slightly off, realignment is easy to make.

3. Use an electric typewriter if available because these machines allow uniform pressure on each type as it strikes through the ribbon. See Figure 2. Use a carbon ribbon attachment, which makes copy of a dense black color necessary for good photographic reproduction. The camera can only reproduce what it sees. Never use a cotton ribbon under any circumstance. A good black silk ribbon is next best to the carbon ribbon. Figure 3, showing unretouched enlargements proves the point.

4. Bookwork is typed in preliminary form to determine how much space will be placed between words to make an even right-hand margin. Preliminary typing can be done on any typewriter of the same size and character count of the machine which will make the final copy. Typewriters equipped with a carbon ribbon should be used only for typing the final copy, or reproduction proof. See Figure 3.

5. *Never* go beyond the blue line designating the margins. If this is done, it will be impossible to align the right-hand margin without retyping the line.

6. After typing the rough copy as closely as possible to the margin lines, mark it with check marks where two spaces will be placed in the final reproduction typing to align the right-hand margin. See Figure 4.

7. When retyping the final or reproduction-proof copy, place an extra space between words which show a check mark. Then the final copy will have an even right-hand margin, as shown in Figure 5.

8. Never mark three spaces between words

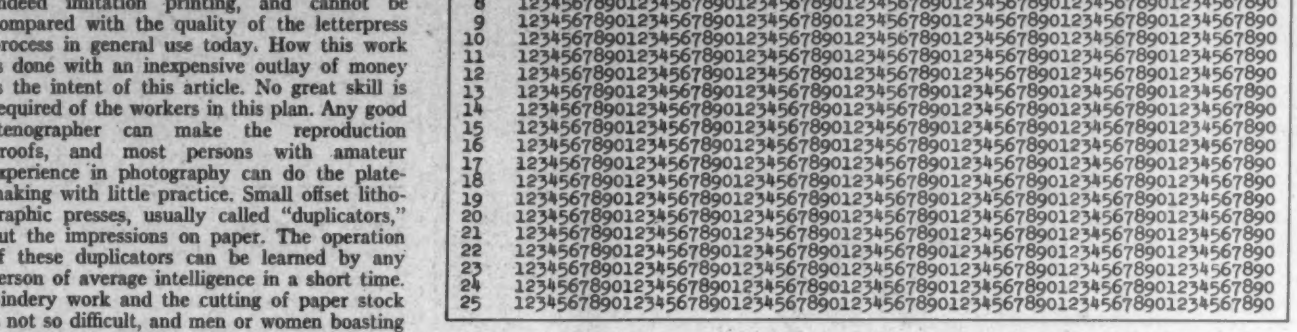


Fig. 1. Layout sheet on which all typing is done. Figures are actual size of typewriter type, and printed in blue ink, which the camera cannot see. Lines 26 through 60 do not appear on this illustration

Fig. 2. An electric typewriter with carbon ribbon attachment. Pressure of the types is controlled and uniform on all characters

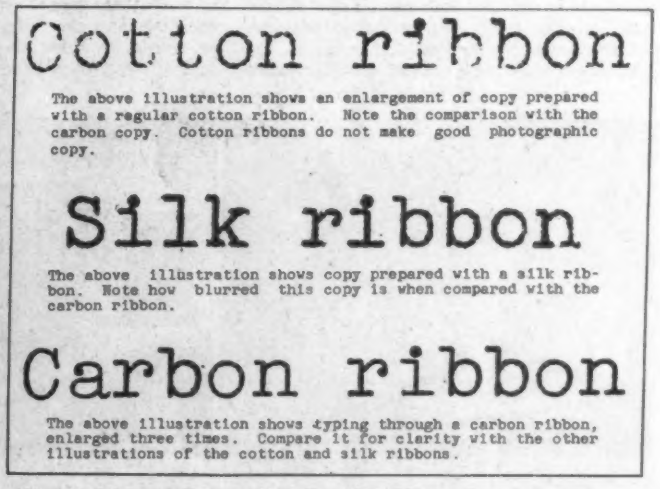
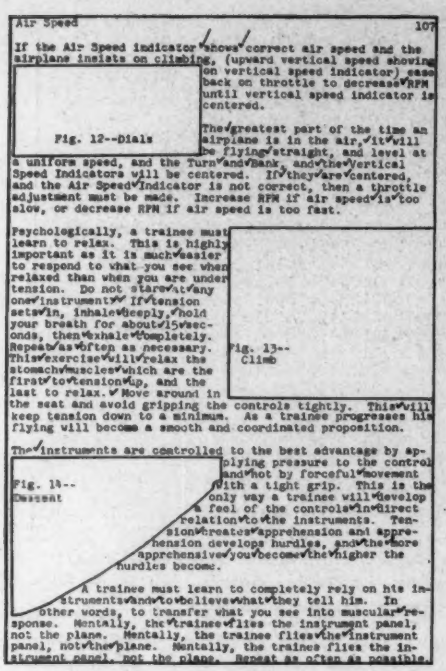

Cotton ribbon
The above illustration shows an enlargement of copy prepared with a regular cotton ribbon. Note the comparison with the carbon copy. Cotton ribbons do not make good photographic copy.
Silk ribbon
The above illustration shows copy prepared with a silk ribbon. Note how blurred this copy is when compared with the carbon ribbon.
Carbon ribbon
The above illustration shows typing through a carbon ribbon, enlarged three times. Compare it for clarity with the other illustrations of the cotton and silk ribbons.

Fig. 3. Triple enlargement of three types of typewriter ribbons, showing why the carbon ribbon is best for photographic reproduction



Air Speed 107

If the Air Speed Indicator shows correct air speed and the airplane insists on climbing, (upward vertical speed showing on vertical speed indicator) ease back on throttle to decrease RPM until vertical speed indicator is centered.

Fig. 12--Dials

The greatest part of the time an airplane is in the air, it will be flying straight, and level at a uniform speed, and the Turn and Bank, and the Vertical Speed Indicators will be centered. If they are centered, and the Air Speed Indicator is not correct, then a throttle adjustment must be made. Increase RPM if air speed is too slow, or decrease RPM if air speed is too fast.

Psychologically, a trainee must learn to relax. This is highly important as it is much easier to respond to what you see when relaxed than when you are under tension. Do not stare at any one instrument. If tension sets in, inhale deeply, hold your breath for about 15 seconds, then exhale completely. Repeat as often as necessary. This exercise will relax the stomach muscles which are the first to tension up, and the last to relax. Move around in the seat and avoid gripping the controls tightly. This will keep tension down to a minimum. As a trainee progresses his flying will become a smooth and coordinated proposition.

Fig. 13--Climb

The instruments are controlled to the best advantage by applying pressure to the control and not by forceful movement with a tight grip. This is the only way a trainee will develop a feel of the controls in direct relation to the instruments. Tension creates apprehension and apprehension develops hurdles, and the more apprehensive you become the higher the hurdles become.

Fig. 14--Descent

A trainee must learn to completely rely on his instruments and to believe what they tell him. In other words, to transfer what you see into muscular response. Mentally, the trainee flies the instrument panel, not the plane. Mentally, the trainee flies the instrument panel, not the plane. Mentally, the trainee flies the instrument panel, not the plane. Repeat as often as possible.

Fig. 4. How preliminary typing is checked for double spacing between certain words to make right-hand margin align. Exast space is left for illustrations, and typing is done around the outlines

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The instruments are controlled to the best advantage by applying pressure to the control and not by forceful movement with a tight grip. This is the only way a trainee will develop a feel of the controls in direct relation to the instruments. Tension creates apprehension and apprehension develops hurdles, and the more apprehensive you become the higher the hurdles become.

Fig. 14--Descent

A trainee must learn to completely rely on his instruments and to believe what they tell him. In other words, to transfer what you see into muscular response. Mentally, the trainee flies the instrument panel, not the plane. Mentally, the trainee flies the instrument panel, not the plane. Mentally, the trainee flies the instrument panel, not the plane. Repeat as often as possible.

Fig. 5. Final copy for the photographer, who makes the negative from which the offset lithographic plate is made. Note even right-hand margin, and well fitting illustrations. Page is reduced from 12-point (pica) typewriter type to 10-point (elite) size photographically

unless absolutely necessary, and then only in lines of very short measure.

9. Do not erase on any final copy typed with or without a carbon ribbon. It is all right to erase on preliminary copy, which does not have to be as clean as the final copy.

10. Take great care not to leave out copy. This is the worst error which can be made, because it entails running over copy from page to page, and delays printing.

11. Mark the locations of all characters before typing in preliminary form, as shown in Figure 4. Follow the guide marks carefully. Illustrations should be provided in the form of original drawings or photographic reproductions of the originals. Type should be run as close to the illustrations as possible, with even margins all around.

12. After retyping to align the right-hand margin, the page is ready for reduction photographically, as shown in Figure 5.

How to Make Corrections

Corrections on the reproduction proof, or final copy, can be most easily made "as one goes," that is, as soon as the line is completed in which the error has been made. Most typists know at once when they make an error. The error should be ignored except for correct spacing, and the entire word in which the error appears is then typed outside the blue margin line at the right of the sheet. When the page has been completed, the corrections are cut out of the margin in such a way that enough of a tail is left for handling, and carefully pasted over the word or words in which the error appeared. The same procedure is used when corrections are found when proofreading. Figure 6 illustrates and gives complete details for making corrections.

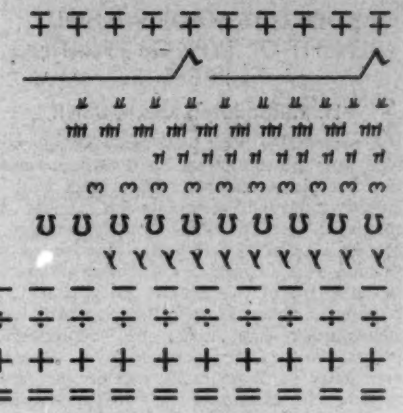


Fig. 7. Special characters are drawn, reduced photographically to pica size, and prints made on light print paper. Cut into strips as corrections, they are pasted onto the photographic copy like a correction. This eliminates drawing all such characters not found on the typewriter keyboard

Special Characters

Regular typewriters do not carry special characters such as arithmetical signs and Greek symbols. To have these characters incorporated in the copy the typewriter produces not only causes delay in doing a book job, but also sacrifices certain needed characters on the original typewriter keyboard.

For occasional characters, the needed signs and symbols can be drawn by a draftsman about twice reproduction size, and photographic prints made to 12-point size (pica) to match the size of the typewriter. Printed photographically in strips as shown in Figure 7, they can be pasted on the copy where needed. Space is left when typing to accommodate these characters.

Making the Plate

After each page of the booklet has been typed in preliminary form, retyped with a carbon or silk ribbon machine to align the right-hand margin, and carefully proofread and corrected, the pages are ready to be photographed. If typed on a pica typewriter,

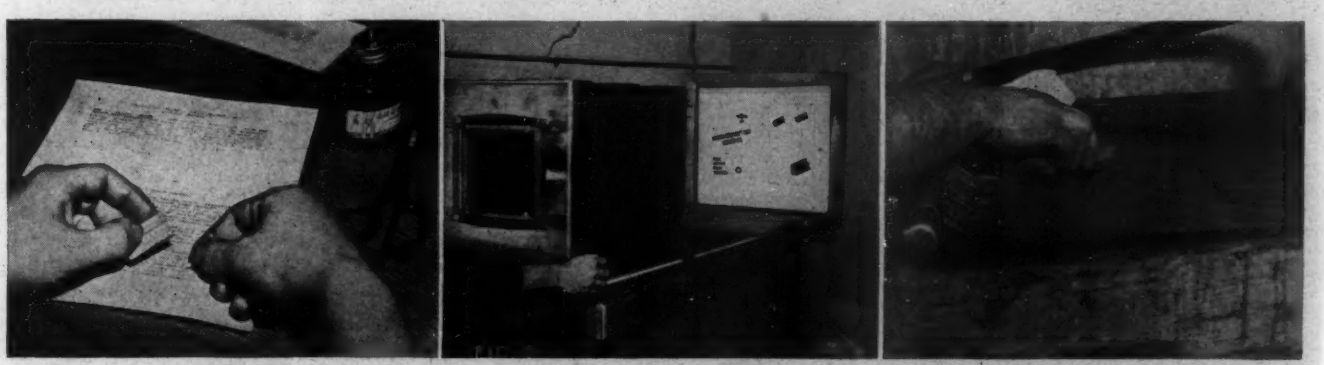


Fig. 6. Corrections on reproduction proof are typed, then cut out leaving as long a tail as possible. Correction is then held by the tail, rubber cemented on reverse side, floated into position over the misspelled word, tapped down with razor blade edge so that smearing is eliminated. The tail is then torn off by holding the razor blade against the tail. Fig. 8. Exposing the negative. Fig. 9. After plate is counter etched, it is washed in cold water

Fig. 10. Plate is placed on whirler, and sensitizer is poured onto plate while it is whirling around. Plate is dried on same whirling machine. Fig. 11. Negative is placed in position on the plate, and both placed in the vacuum frame. An arc light (left) burns in the image. Pages are aligned on orange paper in proper position in negative form. This is called stripping. Fig. 12. Plate is developed with developing ink

the type size is usually too large for bookwork. The usual textbook is printed in ten-point size. One plan for reduction of the page and type size is as follows:

1. Type each page 60 characters wide, and 56 lines deep. This makes the copy 6 inches wide. If reduced to 5 inches wide, the final book page will be in ten-point size, with a good proportionate depth to print two pages at one time on a sheet 9¾ by 14 inches. Duplicators can print two such pages at one time through the press. When printed, folded, and gathered, the book can be stitched through the fold to make a "saddle-wired" job. This is preferable to books side wired, because they can lie open on a desk when being read. Side-wired books snap shut if not held when being read.

Procedure for Making the Plate

1. The first step, shown in Figure 8, is to make a negative of the reproduction typed page with its illustrations pasted into place. As much as $2,000 might be spent on a good darkroom copying camera. However, the only important or expensive element in the accompanying illustration is the camera lens. Excluding the bellows, the entire camera was homemade. Piping serves as the base, wood construction makes up the balance of the equipment.

2. Offset lithographic plates, usually of zinc, are provided by the manufacturers of the duplicator used. These plates can be used over and over again by having them *regrained* after each printing. Regraining removes the used image, and roughens the surface so that it can retain and hold water and lithographer's ink.

The plate is counteretched to remove any oxidization and foreign elements which adhere to the surface.

Procedure: Place the plate in a pan filled with one gallon of water and 6 ounces of acetic acid. Let the plate stay in the pan for about ten seconds or more. Then remove the plate and place it in the sink and swab with cotton, after which it should be washed with cold water, as shown in Figure 9. The equipment consists of a homemade wood sink, with hot and cold water attached to a pipe in which many holes have been bored to create a spray system.

The plate is swabbed again with the desensitizing etch and washed.

3. Then the plate should be placed grained side up on a whirler, as shown in Figure 10. The whirler was bought at a reasonable price.

Procedure: Set the whirler to operate at about 50 to 60 revolutions per minute. While whirling, spill several ounces of water on the plate to insure cleanliness. Pour one ounce of plate sensitizer on the center of the plate, and whirl until dry. This takes about 4 minutes.

Formulas for plate sensitizers will fill many pages of instruction. One used satisfactorily is as follows:

Egg albumin, 2½ ounces.

Ammonium bichromate, 1 ounce.

Ammonium (28 per cent solution) 1½ ounce.

Fill beaker with 32 ounces of water. Place egg albumin in cheesecloth, and tie the cheesecloth in the form of a bag and place in beaker with the 32 ounces of water. Fill another beaker with 8 ounces of water. Put ammonium bichromate in the beaker, and let stand overnight. The minimum dissolving time is four hours. When mixing, allow egg albumin in cheesecloth to drain. Do not squeeze the bag. Pour 1½ ounces of ammonium into ammonium bichromate solution and stir. When the cheesecloth has drained, pour the bichromate solution into the egg albumin and stir.

4. Lock the plate and negative into a

Fig. 13. Developing ink is washed off with lukewarm water in the sink. Developing ink sticks to image only. Plate is then gummed to prevent oxidization

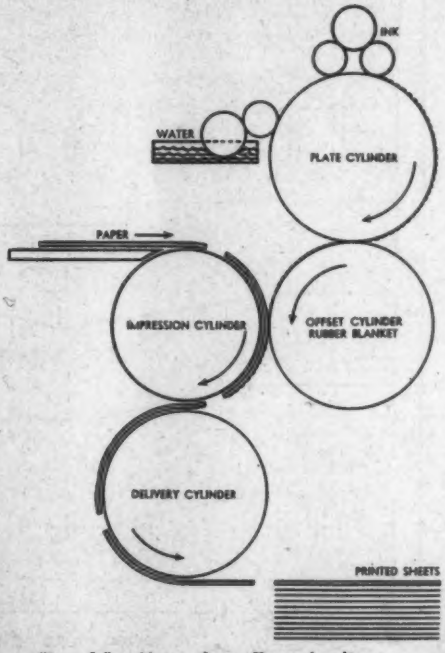


Fig. 15. How the offset duplicator operates. The plate on the plate cylinder is moistened, then inked. Moisture adheres to the non-image areas only. When the inking rollers touch the plate, the ink adheres only to the image areas. Lithography is based on the principle that water and grease do not mix. The image is transferred to a rubber blanket. The rubber blanket "offsets" the image to the paper, using the rotary press principle, which allows speeds of 6000 sheets per hour

— Illustration, courtesy of the "Seventh Production Yearbook"

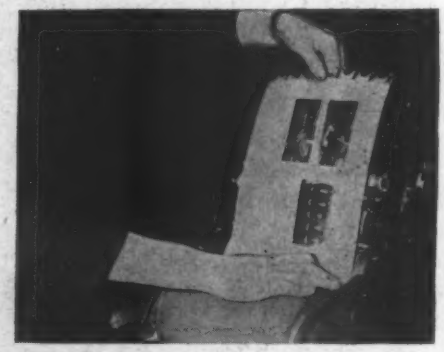


Fig. 14. Plate is placed on plate cylinder of an offset duplicator

vacuum frame. These frames cannot be homemade, because they consist of an electric motor and suction pump which draws all air from the frame. In the vacuum thus created, the negative and plate are sealed together tightly so that no exposure of the plate is made unless the light comes through the negative itself.

The negative is stripped to a piece of orange opaque paper to insure correct position of the plate. The orange stock is sold at most local paper dealers, and is made expressly for lithographers. Usually cut to the same size as the lithographic plate itself, the paper is cut out in such a fashion that the negative is positioned in the correct position for printing.

After checking to make sure that the negative is correctly positioned on the plate, the motor of the vacuum frame is turned on, and allowed to run until the exposure is made. The frame is moved to a vertical position as shown in Figure 11 (note masking paper and negative in position) and a carbon arc lamp (25 amperes) is turned on. In about 6 minutes the exposure is made, and the motor of the vacuum frame turned off; the frame is brought to horizontal position, and the glass lifted to remove the plate and negative.

5. The plate is developed with developing ink as shown in Figure 12. Care must be taken to see that the entire area is covered completely with the developing ink. A piece of cotton is used to apply the ink.

6. The plate is then returned to the sink, where the developing ink is removed by swabbing under lukewarm water, as shown in Figure 13.

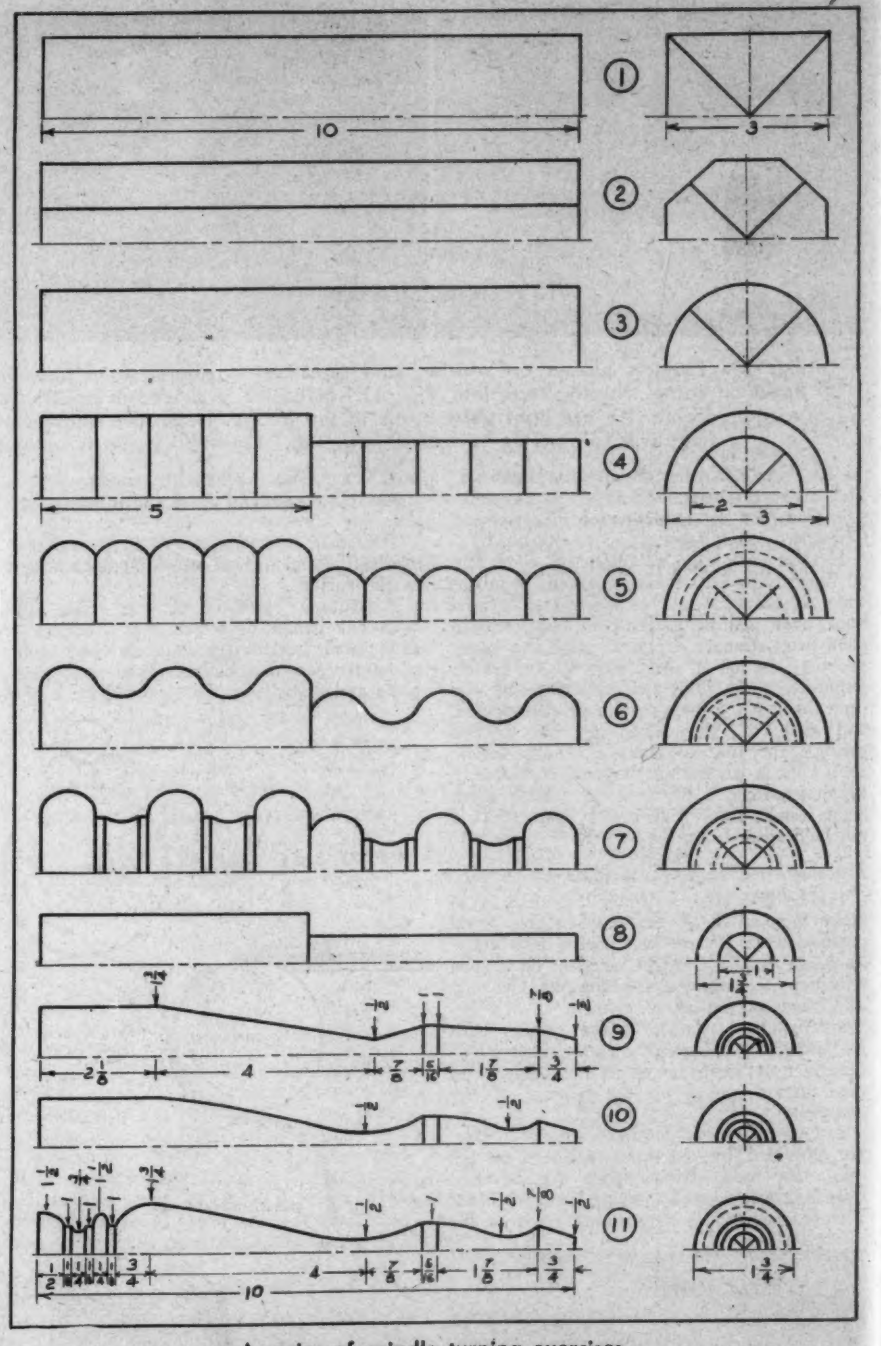
7. The plate is then gummed, using a cotton swab. One formula for making the gum is as follows:

Pour 8 ounces of water into a beaker, and add 3 ounces of gum arabic slowly, stirring the water at the same time. Add ¼ ounce of phosphoric acid and stir well. Stir the solution every half hour until it has dissolved completely. This will take approximately three hours. Strain through cheesecloth to remove any impurities.

8. The plate is then ready to place on the press, as shown in Figure 14.

The Lithographic Process

The lithographic process explained in the preceding paragraphs has made great strides during the past ten years. It is the fastest growing process for laying ink on paper. The rotary press principle is used, which allows far greater press speeds than does letterpress-work. Just how the ink is placed on the paper is shown in the diagrammatic view of the press in Figure 15.



A series of spindle turning exercises

SPINDLE TURNING

HAROLD M. GRAY

Sumner High School

St. Louis, Mo.

In most beginning courses in high school woodworking, students are required to learn how to use the lathe.

A well-outlined procedure involving the common use of tools and simple designs is important in teaching pupils correct work habits on this important basic machine.

To make the information and operations easy for students to comprehend, many instructors make use of instruction sheets.

The procedure steps illustrated in the accompanying illustration follow each other in logical sequence. All common lathe tools that would ever be used by a student are involved in carrying out the various steps.

From such a procedure the pupil can also learn the elements of design on a lathe, such as how to make a bead, a cove cut, a shoulder, a curve of force, and the like.

The proper procedure to finish a piece on the lathe can be taught as a part of the sheet. Thus a student learns all basic essentials in a clear concise outline.

Method of Procedure

1. Select a piece of stock 3 in. square and 10 in. long, and saw diagonals on each end of the stock ⅛ in. deep.

2. Plane arrises, until piece is shaped octagonally.

3. Force live center in one end, and mount piece in lathe. Precautions: (*a*) see that tailstock is tight; (*b*) place oil dead center for lubrication; (*c*) tighten the spindle clamp; (*d*) keep the tool rest ¼ in. from the work; (*e*) use slow speed for roughing.

Use the gouge and turn the piece into a plain cylinder.

4. Measure off 5 in., and mark with a parting tool. Then turn the remainder of the piece to 2-in. diameter.

5. With a skew chisel make beads of varying size the full length of the stock.

6. Use a roundnose tool and make concave cuts, removing every other bead.

7. With the parting tool make shoulder cuts between beads and concave cuts.
8. Cut off all designs, leaving piece as shown.
9. Taper piece, using gouge and skew as indicated.
10. With the roundnose tool turn the stock to the shape indicated.
11. Turn piece to the shape and dimensions given.
12. Sandpaper the piece with medium and fine sandpaper.
13. Apply shellac. Allow it to dry while lathe is running.
14. Steel wool, and apply a second coat.
15. Rub down finish while lathe is running and apply wax.
16. Polish waxed surface.

Name _____ 19____
Surname First Name Date of Birth

Address _____ Telephone _____

RADIO TRAINING PROGRAM FOR U. S. SIGNAL CORPS AND NAVY

Signal Corps Mechanic Learner_____ Navy Radio Technician_____ Advance Signal Corps_____

LOS ANGELES CITY SCHOOL DISTRICT
DIVISION OF INSTRUCTION AND CURRICULUM, VOCATIONAL AND PRACTICAL ARTS SECTION

_____ High School

RECORD OF TRAINING

SOLDERING AND SPLICING		**CONDENSERS—Continued**	
1. Make a Western Union splice		43. Calculate value of condensers in parallel	
2. Make a tap splice		44. Calculate capacity from reactance formula	
3. Make a pigtail splice		45. Measure reactance of condenser	
4. Tin a soldering copper		46. Measure power factor of condensive circuit	
5. Solder splices		**INDUCTANCE**	
6. Cable and lace wires		47. Test coil for short-circuit	
USE OF TOOLS		48. Test coil for open circuit	
7. Use a wire gauge correctly		49. Measure inductance with slide-wire bridge	
8. Use a micrometer correctly		50. Calculate value of inductances in series	
9. Sharpen and use screwdrivers correctly		51. Calculate value of inductances in parallel	
10. Use a hacksaw correctly		52. Measure impedence of coil	
11. Use a scriber for layout on sheet metal		53. Calculate inductance from reactance formula	
12. Sharpen a twist-drill correctly		54. Measure power factor of inductive circuit	
13. Drill holes in sheet metal		**RESONANCE**	
14. Use a blowtorch correctly		55. Make series resonance experiment at 60 cycles	
15. Use a machine screw tap correctly		56. Make series resonance experiment at radio frequency	
16. Use a machine screw die correctly		57. Make parallel resonance experiment at 60 cycles	
SALVAGING		58. Make parallel resonance experiment at radio frequency	
17. Make a sketch of a circuit		**POWER SUPPLIES**	
18. Remove parts from chassis		59. Build power supply with choke input	
19. Test parts		60. Build power supply with condenser input	
MEASURING INSTRUMENTS		61. Plot voltage regulation curve of power supply	
20. Use a voltmeter correctly		**RECEIVING CIRCUITS**	
21. Use an ammeter correctly		62. Build one-tube detector with grid-leak	
22. Use an ohmmeter correctly		63. Build one-tube detector with resistance regeneration control	
23. Use an oscilloscope correctly		64. Build one-tube detector with condenser regeneration	
24. Use a vacuum tube voltmeter correctly		**AMPLIFIER CIRCUITS**	
25. Use a R. F. Signal generator correctly		65. Build class A audio frequency amplifier	
26. Use an audio oscillator correctly		66. Build class B audio frequency amplifier	
27. Use a tube checker correctly		67. Couple audio amplifiers to detector with resistance coupling	
RESISTORS		68. Couple audio amplifiers to detector with transformer coupling	
28. Test resistors for continuity		69. Build radio frequency amplifier	
29. Measure resistance with voltmeter and ammeter		70. Couple radio frequency amplifier ahead of detector	
30. Measure resistance with slide-wire bridge		**TRANSMITTERS (Use Dummy Antenna)**	
31. Calculate resistances in series		71. Build crystal oscillator	
32. Calculate resistances in parallel		72. Wind tank coils for various frequencies	
VACUUM TUBES		73. Build radio frequency amplifier	
33. Diode: Plot filament volt-plate current curve		74. Neutralize R. F. amplifier	
34. Triode: Plot filament volt-plate current curve		75. Couple R. F. amplifier to oscillator	
35. Triode: Plot grid volt-plate current curve		76. Check output of transmitters with frequency meter	
36. Tetrode: Plot grid volt-plate current curve		**ANTENNAS**	
37. Calculate amplification factor of vacuum tube		77. Construct flat top antenna for four-meter oscillator	
38. Calculate plate resistance of vacuum tube		78. Construct doublet for four-meter oscillator	
CONDENSERS		79. Construct di-pole antenna for two-and-one-half meter oscillator	
39. Test condenser for short circuit			
40. Test condenser for open circuit			
41. Measure capacity with capacity meter			
42. Calculate value of condensers in series			

6-40

SUMMARY OF TRAINING

	Dates From	Dates To	Total Hours of Training	Grade Received	High School Credits	Instructor
First Semester						
Second Semester						
Third Semester						
Fourth Semester						

REMARKS:

Radio Maintenance Training Program
Los Angeles City Schools
Vocational and Practical Arts Section
CERTIFICATE OF COMPLETION

This certifies that

_____

has completed the Junior Radio Technician course.

Date_____ School_____

Instructor_____ Principal_____

Front and reverse sides of training record card. Also the certificate of completion issued to students who have finished the Radio Maintenance Training Program. These forms were submitted by Claude E. Nihart, director of vocational and practical arts, city schools, Los Angeles, Calif.

SAFETY IN THE SCHOOL SHOP

SAMUEL F. HALL
High School
Clayton, Mo.

(*Continued from page 126 of the March, 1944, issue*)

Hammers as a Cause of Accidents

General Information: You may have a hammer at home with a loose head, or one that is badly *mushroomed*. If so, why not bring it to school for repair? You can put your tools in good order here in the school shop.

Striking tools are dangerous at times, so let us make them safe. When drawing striking tools from the toolroom, examine them for defects and be sure they are sound. It may be your bump to nurse.

Specific Instruction

1. Use hammer intended for the job.
2. Do not use broken or taped handles.
3. Be sure the heads are fastened securely to the handles.
4. Mallet heads should not slide off of the handles.
5. Mallets should be used to pound wood chisels.
6. All striking tools should be held well back on the handle.
7. Hatchet heads should be secure on the handles.

Assignment

1. Where is a ball-peen hammer used? ....
2. From what kind of wood are handles made? Why? .....
.....
3. How can a *mushroomed* head be repaired? .....
.....
4. Why are cast-iron hammers dangerous?
.....
5. Why is it unwise to drive a hatchet into the ground? .....
.....
6. How do the Boy Scouts carry hatchets?
.....
7. When two boys are using a sledge hammer and cold chisel or star drill, what precautions must be observed? .....
.....

Discussion

In splitting wood with a hatchet or ax what dangers should be avoided?

Tell of some experience you have had with a hatchet at home or out in the woods.

References

Stanley Educational Charts, "How to Use the Nail Hammer," No. 118.

Wyatt, E. M., *Common Woodworking Tools, Their History*, p. 9 (Milwaukee: The Bruce Publishing Company, 1936).

Boy Scouts of America, *The Handbook* (New York, 1937).

Wheeler, Charles G. A., *Manual of Woodworking*, p. 29 (New York: G. P. Putnam's Sons, 1925).

Using Your Knife Correctly

General Information

A good sharp sheath knife, clasp knife, or carving knife is a most useful tool, but like the ax and the hatchet, it must be used with reasonable care.

1. When not using keep the sheath knife in the scabbard, keep the clasp knife closed.
2. Keep the knives off the floor.
3. In most cases cut away from yourself. Use shearing cuts.
4. See that no part of your body or that of a companion is within sweep of the blade.
5. Learn to grind and hone a knife.

Assignment

1. Should you use a knife to pry off a board? .....
.....
2. In whittling wide surfaces where do you cut first? Why? .....
.....
3. Dan Beard, the Scouter, always rounded the points of his knives? Why? .....
.....
4. Keep the arm which holds the wood against your body? Why? .....
.....

PROGRESS CHART FOR THE PRINT SHOP

NORMAN CROUCH

Maine Township High School

Park Ridge, Ill.

The progress chart shown herewith was designed for a class in Printing I.

It may be used in eight weeks' rotating classes (for an earning power of 20,800 points), or the complete chart represents a semester of Printing I.

It has been tested for several years, and while it is not perfect, it has been found very effective.

EVALUATING THE SCHOOL SHOP OR LABORATORY

HEBER A. SOTZIN

Director, Division of Industrial Arts

San Jose State College

San Jose, Calif.

At present, educational conferences, conventions, and meetings are characterized largely by discussions of certain defects and weaknesses in our system of public education. While many of these deficiencies have been known to teachers and administrators alike, the war has intensified them and makes the necessity for changes clearer. Consequently, everywhere one finds teachers and educational authorities studying their individual and collective professional problems intently, with the expectation that when the war ends our public schools will have learned many valuable lessons and will be better equipped to cope with educational problems and render a more effective public service than heretofore.

In the areas and programs of industrial

(Continued on pages 301 and 302)

PROGRESS CHART FOR PRINTING	Instructor's Initials	Possible Points	Your Points	Time Limits on Job	Time Started	Time Finished	Your Time		
1. Progress Chart		300							
2. Chart on Art of Printing		250							
3. Lay of California Job Case		500							
4. Distinguish Difficult Characters		600							
5. Position and Use of Quads and Spaces		550							
6. Parts of Piece of Type		700							
7. Position and Use of Ligatures		380							
8. Point System		900							
9. Inventory of Type Case		1,500							
10. Job No. 1-Name Card		2,500							
Procedure A. Job Plan									
B. Actual Scale Drawing									
C. Lists of Materials									
D. Mechanical Procedure									
E. Related Information									
11. Job No. 2-Business Card Procedures A to B as Above		3,500							
12. Job No. 3-Identification Blank Procedures A-B		5,000							
Inventory of Case		3,500							
Total Points for Passing Grade		20,150							
Job No. 4-Job of Your Choice Procedures A-B									
Job No. 5-Job or Your Choice Procedures A-B									
Job No. 6-A Song Procedures A-B									
Job No. 7-An Informal Letter Procedures A-B									
Job No. 8-Initial Letter Job Procedures A-B									
Job No. 9-Sports Calendar Procedures A-B									
Job No. 10-Inventory of Skills									
Inventory of Related Knowledge									
Inventory of Case									

Progress chart for the print shop by Norman Crouch

Score Sheet

Physical Plant	Superior — 5 pts. (5)	Above average — 4 pts. (4)	Average — 3 pts. (3)	Below average — 2 pts. (2)	Mediocre to poor — 1–0 pts. (1)	Remarks
1. Type of construction (Class A, B, C, D building)						
2. Location of shop or laboratory in relation to other parts of the school building or school plant						
3. Floor layout or plan (convenience and efficiency of use)						
4. Arrangement of equipment (sequence of use)						
5. Working space for students (50 to 75 sq. ft. per student)						
6. Lighting (15–25 foot-candles per student)						
7. Heating (temperature min. 55, max. 65)						
8. Ventilation (varies with cubical contents of room and type of activity)						
9. Noise (soundproofing; use of acoustical plaster, etc.)						
10. Safety measures						
11. Fire precautions						
12. Care and use of public utilities *a*) Electricity *b*) Gas *c*) Water						
13. Storage space for supplies						
14. Storage space for pupils' work						
15. Storage space and provision for general and special tool facilities *a*) Central toolroom *b*) Individual toolroom *c*) Tool cabinet 1) Wood 2) Metal *d*) Open tool panel or rack *e*) Portable tool panel or rack						
16. Display and bulletin boards						
17. Display cases or cabinets						
18. Blackboard facilities						
19. Classroom facilities						
20. Other demonstration facilities						
21. Lavatory facilities						
22. Locker facilities						
23. General condition of tools and equipment						

	Superior — 5 pts. (5)	Above average — 4 pts. (4)	Average — 3 pts. (3)	Below average — 2 pts. (2)	Mediocre to poor — 1–0 pts. (1)	Remarks
24. General physical condition of shop						
25. Plan for upkeep and repair of equipment						
Curriculum						
1. Specific aims and objectives of curriculum area						
2. Realization of objectives of curriculum area						
3. Curriculum offerings or areas of occupational endeavors or activities						
4. Course of study for subject division, i.e., electricity, woodwork, mechanical drawing, etc.						
5. Sequence of courses						
6. Selection of projects and activities for developing course aims						
7. Construction of projects and activities						
8. Evaluation of activities						
9. Instructional methods *a*) Modern *b*) Outmoded *c*) Functional *d*) Teacher dominated *e*) Teacher guided and directed						
10. Instructional materials						
11. Illustrative materials						
12. Visual aids						
13. Related information						
14. Shop or laboratory library						
15. Reference materials in general library						
Shop or Laboratory Management						
1. Assignment of work stations and other facilities (tables, benches, lockers, etc.)						
2. Rules and regulations relative to use of shop, tools, materials, working after regular class hours, etc.						
3. Method of issuing tools						
4. Method of issuing materials and supplies						
5. System of records						

Score sheet for evaluating the school shop or laboratory by Heber A. Sotzin

	Superior — 5 pts.	Above average — 4 pts.	Average — 3 pts.	Below average — 2 pts.	Mediocre to poor — 1–0 pts.	
	Points					
	5	4	3	2	1	Remarks
6. System of inventories						
7. System of grades						
8. System for recording pupil progress						
9. Shop wearing apparel						
10. Conduct of pupils						
Personnel						
1. Grade level of school						
2. Age level for grade						
3. Time (days per week — hrs. per day)						
4. Class size						
5. Attitude of pupils toward work						
6. Attitude of teacher toward work						
7. Pupil-teacher relationship						
8. Teacher's technical and industrial experience						
9. Teacher's professional preparation						
10. Teacher's professional interest						
11. Teacher's personal appearance						
12. Teacher's public relationships						
Financial						
1. System for handling money as related to supplies and materials						

	Superior — 5 pts.	Above average — 4 pts.	Average — 3 pts.	Below average — 2 pts.	Mediocre to poor — 1–0 pts.	
	Points					
	5	4	3	2	1	Remarks
2. System of fees to cover cost of general supplies						
3. System to cover cost of materials for personal projects						
4. Cost per pupil per *a*) Semester *b*) School term *c*) School year						
5. Adequacy of supplies						
6. Adequacy of equipment						
7. Adequacy of budget						
8. Replacement policy for tools and equipment						
Additional Items or Factors						
Summary of Findings						
Evaluation of Findings						
Recommendations						

Score sheet for evaluating the school shop or laboratory by Heber A. Sotzin

arts (general education) and vocational education (specific occupational training), current discussions are based principally upon the scarcity of teachers, the need for better selected and trained teachers, a more functional program, a broadening of activities and offerings, the replacement of obsolete equipment, the inclusion of new industrial processes and materials, and better and more intelligent leadership and supervision. An additional need, and probably the foremost need, is the clarification of terms, aims, objectives, and functions relative to manipulative work offered as a curriculum area of general education and the organized program of specific occupational training which leads directly to the earning of a livelihood. In the light of these problems and the necessity for adjusting to a peacetime educational basis, as rapidly, efficiently, and effectively as possible when the war is concluded, it is suggested that now is a propitious time for self-examination and planning for the future. The score sheet on pages 301 and 302 is a suggested plan for this purpose.

Conclusion

It should be noted that the score sheet is planned on a five-point basis and that a weight ranging from zero to five is given to each item. This has been done arbitrarily and will be objected to by some. There is no reason why the items cannot be weighted differently, changed, or modified to satisfy the convenience of the surveyor. The chief factor involved is a brief, clear, concise, and specific evaluation of existing conditions; and the ability of the shop teacher to present a report to his superiors in exact terms relative to his needs and problems. An evaluation of this type and scope precludes generalities and is an intelligent approach to the instructor's teaching activities and the multiplicity of problems involved in his work.

A PLACE FOR GAMES IN MODERN SHOP PRESENTATION

VERNON D. STAPLEFORD

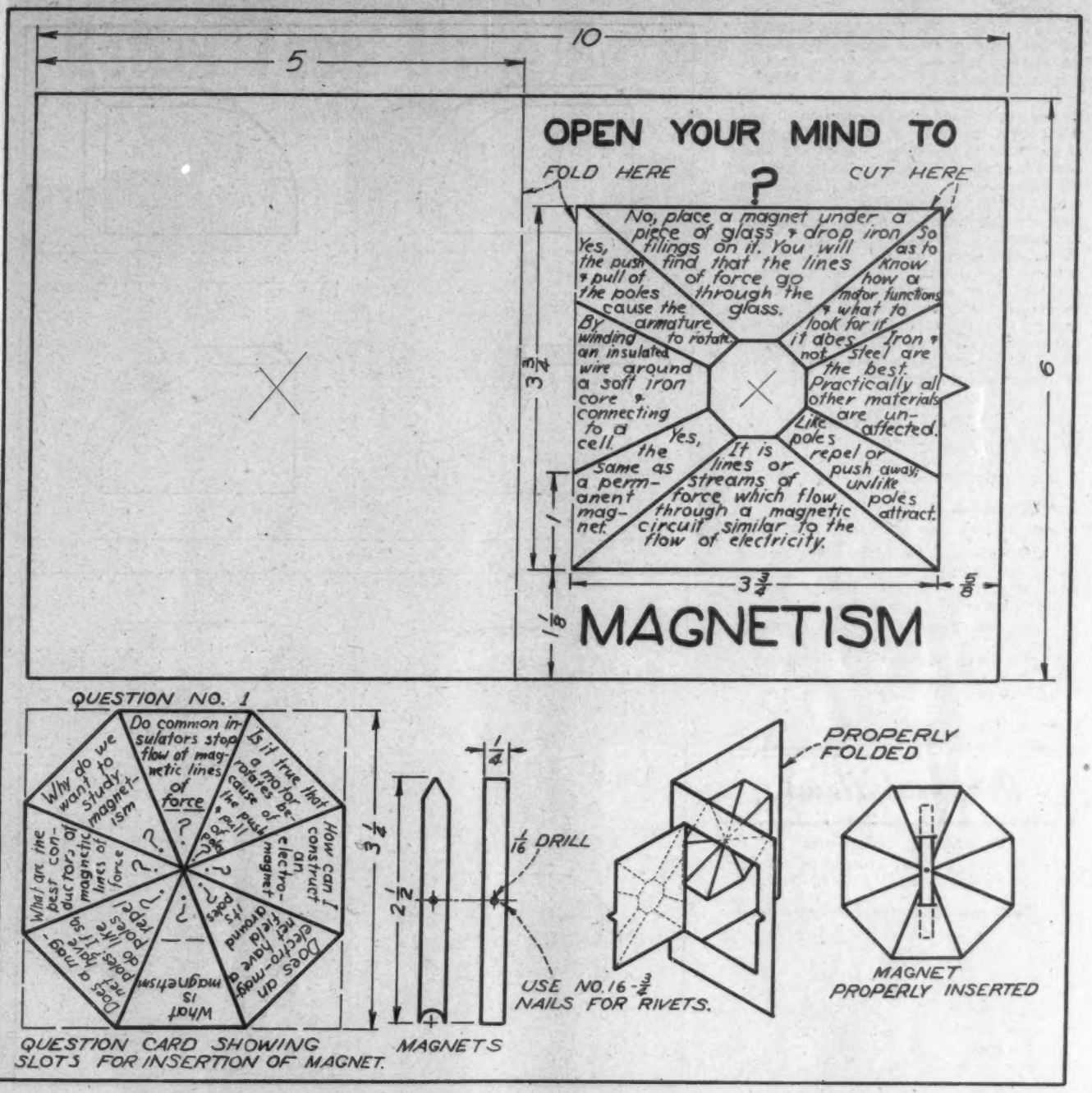
Branford, Conn.

The more recent trend in industrial-arts teaching is to do away with the stiff, formal methods of presenting subject matter.

The interest span of the average boy is not very great. It is a well-known fact that unless a certain subject can be made to appeal to the youngster, his active mind is going to seek satisfaction in some other line. It may be that he will develop a definite dislike for the particular type of work the teacher is giving him.

If it were possible to teach the subject matter in such a manner that the boy enjoys it, a happy situation is certain to exist. Any device that stimulates the inborn tendency to explore cannot help but make the boy interested in the subject.

The project presented herewith is designed to give the pupil an opportunity to explore


10
5
OPEN YOUR MIND TO
FOLD HERE
?
CUT HERE
No, place a magnet under a piece of glass & drop iron filings on it. You will find that the lines of force go through the glass.
Yes, the push & pull of the poles cause the armature to rotate.
So as to know how a motor functions & what to look for if it does not.
By winding an insulated wire around a soft iron core & connecting to a cell.
Iron & steel are the best. Practically all other materials are unaffected.
Yes, the same as a permanent magnet.
It is lines or streams of force which flow through a magnetic circuit similar to the flow of electricity.
Like poles repel or push away; unlike poles attract.
3 3/4
3 3/4
1/16
6
MAGNETISM
QUESTION NO. 1
Why do we want to study magnetism
Do common insulators stop flow of magnetic lines of force
Is it true that a motor rotates because of the push or pull of the poles
How can I construct an electro-magnet
Does an electro-magnet have a magnetic field around it's poles
What is magnetism
Does a magnet's poles have the same poles like it say repels
What are the best conductors of magnetic lines of force
QUESTION CARD SHOWING SLOTS FOR INSERTION OF MAGNET.
3 1/4
1/4
1/16 DRILL
2 1/2
USE NO.16 - 3/4 NAILS FOR RIVETS.
MAGNETS
PROPERLY FOLDED
MAGNET PROPERLY INSERTED

A game for demonstrating a few facts about magnetism

a new subject, in the manner of playing a game.

By making separate games for each subject, there is no end to the information that can be opened up to the student in an entertaining manner.

By correlation of the work with the print shop enough games could be made so that every boy in the electrical class might have one.

Constructing the Game

Any plain, flexible cardboard may be used for the folder and octagon. Letter in the questions and answers in the proper places. The illustration shows clearly the method of folding.

Making the magnets: An old hack-saw blade may be used as metal for making the magnets. The side of the blade that has the teeth on it should be ground down to the size shown. Hold the blade in a vise and snap off to the correct length. Grind the arrow to the correct shape. Before drilling the holes, it will be necessary to remove the temper from the steel. An easy way to do this is to heat the pieces in a gas furnace or blowtorch until they are a bright red. Remove from the flame and lay on a piece of wood until cool. It is necessary to allow the pieces to cool very slowly or the metal will not soften. Mark the center of each piece with a center punch and drill the holes. Before the metal can be magnetized it must be retempered. Heat the metal to a bright red color and immerse in cold water, keeping the metal moving in a circular motion until cool.

An old clock spring will make a fine magnet. If this is used, the easiest way to make the holes in it is with an ordinary nail set used as a punch. Hold the metal over the end of a piece of hardwood when punching.

Magnetizing: Wind 30 to 40 ft. of No. 18 insulated magnet wire around a paper cylinder such as the kind a calendar comes in. If a layer of friction tape is wound over the cylinder before the wire is put around it, there is less likelihood that the coil of wire will slip. Connect the ends of the wire to a direct current. Three or four dry cells may be used or an ordinary train transformer.

Place the pieces to be magnetized inside the coil and leave for a few minutes. Disconnect the current and the steel will have been magnetized.

Assembling the game: Crease the folder in the proper place and glue the edges on all four sides. Rivet the arrow in place on the front of the folder so that it will spin freely. Then rivet the octagon to the front of the back of the folder so that it is directly beneath the arrow. The octagon should also be movable. Slide the other magnet through the slots in the octagon as shown in the drawing. Turn the octagon around so one of the questions is under the question mark. Close the folder and see if the arrow points to the correct answer. If the arrow points to the opposite answer, turn the octagon's magnet end for end and then the arrow will answer correctly. Rivet the octagon to the back of the folder and the game is ready for use.

CABINET DRAWING

W. W. STURTEVANT

South High School

Minneapolis, Minn.

(Continued from page 255, June, 1944, issue)

Plate 7 shows 4 blocks in which arcs of circles are combined with straight lines. The point of tangency on the lines showing the farther edge of the block is found by drawing a 45-deg. line through the point of tangency on the front of the block.

Plate 8 shows somewhat more difficult exercises. Two of these exercises may be combined with two from Plate 7.

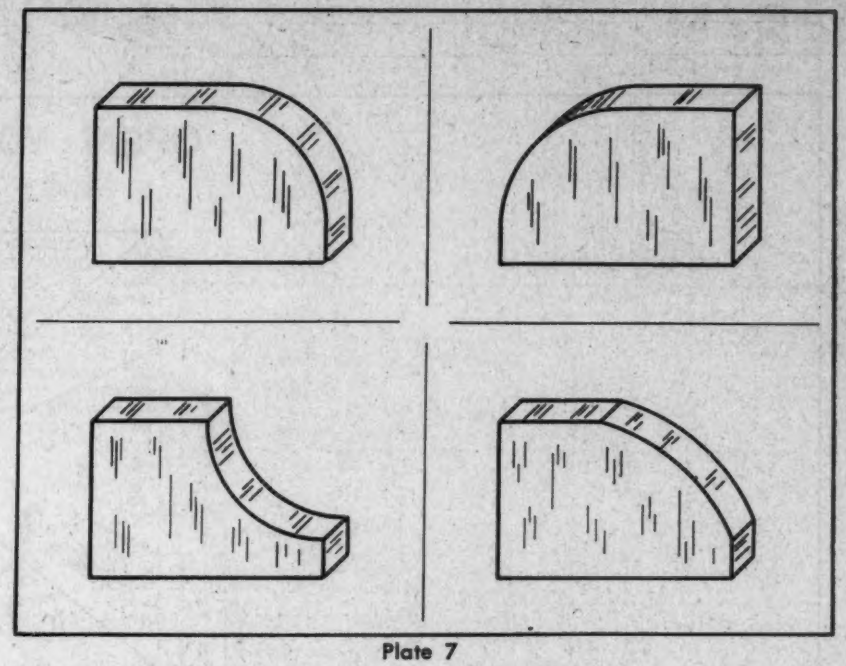


Plate 7

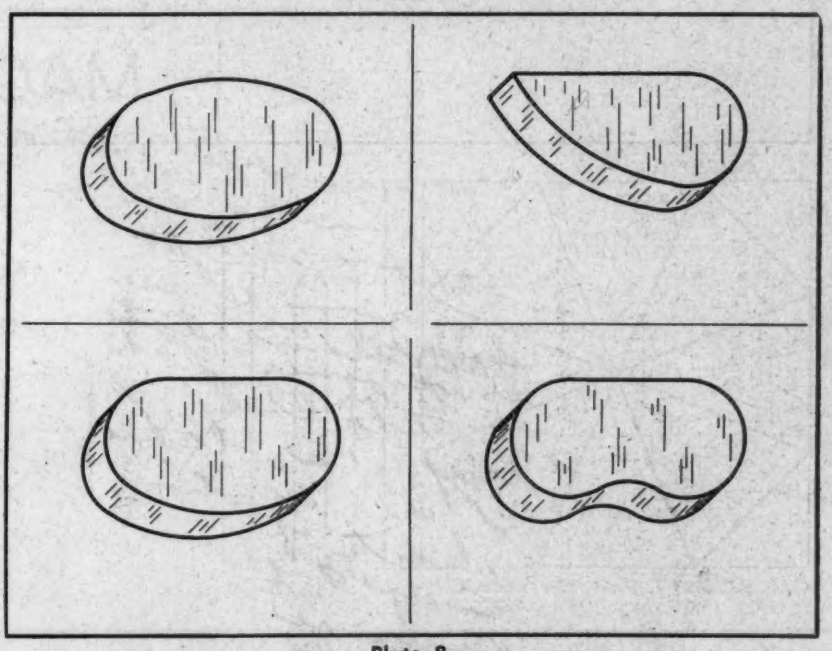


Plate 8

Personal News

DR. ROBERT L. COOLEY DIES

Dr. Robert L. Cooley, founder of the Milwaukee Vocational School, Milwaukee, Wis., died May 19, 1944, after being in ill-health for four years.

Plaque at the Milwaukee Vocational School

Dr. Cooley was born May 3, 1869, on a farm at Waubeka, Wis. He attended a district rural school until he had finished the eighth grade. Thereafter his duties on the farm and in his father's lumber mill and factory kept him busy. Nevertheless, by home study and reading he succeeded in getting a teacher's certificate via the state examination route when he was 17.

In 1890 he entered what is now known as the Oshkosh State Teachers College. Upon graduation from this institution he was appointed teacher of mathematics and science at the high school at Oconto, Wis. The following year he was appointed principal of the high school, superintendent of the Oconto public school system, and clerk of the school board. He held these three jobs, until he came to Milwaukee in 1902, where he served as principal of the Eighteenth Street and Robert M. LaFollette schools for nine years.

When the continuation school law was enacted in 1911, Milwaukee chose Dr. Cooley as the first director of the Milwaukee Central Continuation School, later known as the Milwaukee Vocational School. Under his management the school expanded so that it became nationally and internationally famous.

Ill-health caused him to resign the directorship in 1940.

In 1942 The University of Wisconsin conferred on him an honorary master of arts degree, and The Stout Institute granted him the degree of doctor of science in 1925.

He was president of the American Vocational Association in 1928 and 1929, and president of the Wisconsin Teachers' Association in 1928. In 1929 he was appointed to a nationwide advisory

(Continued on page 28A)

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Manual training instructors tell us that Disston tools help their students to produce better work. And these better results provide the incentive and encouragement which most youngsters need.

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Filing Hints To Meet Your Needs

Right Way to Hold a File

Fig. 1. Right way to hold a file with both hands.

Hold the handle of the file with the right* hand, and the tip of the file with the left hand. Although the position of the left hand varies with the job to be done, the right-hand grip remains the same. See Fig. 1. The beginner should let the file handle rest in the palm of the right hand, with the thumb lying along the top of the handle and the fingers curling around the handle and falling into a natural grip.

Fig. 2. Correct grip for removing stock rapidly.

When the tip of the file is gripped with the left hand, as shown in Fig. 2, with the ball of the thumb pressing upon the top of the file and lying in line with the file axis, and with the fingers winding around the file, a powerful grip is secured. When a lighter stroke is wanted, the direction of the left thumb is changed more and more until it lies at right angles, or nearly so, with the length of the file. The tip of the file is then held between just the thumb and the first two fingers of the left hand.

Fig. 3. Correct grip for flat filing.

Fig. 3 shows the correct method of holding the file for flat filing. Fig. 4 shows the correct method of holding the file for very accurate work, or when curved surfaces are to be filed. The grip shown allows maximum guidance and control.

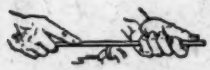

Fig. 4. Correct grip for precision work.

Awarded to the Newcomerstown, Ohio, Plant

*The directions given are for a right-handed person. By reversing the file positions, they will apply as well for a left-handed person.

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HELLER NUCUT FILES
WAVY TEETH

(Continued from page 304)

committee of secondary education by Ray Lyman Wilbur, then Secretary of the Interior.

Dr. Cooley is survived by Carrie Ide Cooley, his widow, and two daughters.

♦ DR. HOMER J. SMITH addressed the Milwaukee Schoolmasters' Club, Saturday, May 6, 1944. The subject of his discourse was "Some Beliefs About Vocational Guidance."

♦ R. RANDOLPH KARCH, principal of the Cincinnati Vocational School of Printing, Cincinnati, Ohio, now on leave to serve in the Navy, has been placed in charge of the planning of books and other publications for aviation training in the United States Navy. He is located in the Training Literature Section, Bureau of Aeronautics, Navy Department, New York City.

♦ W. L. ENGE, co-ordinator at the Vocational School, Eau Claire, Wis., was appointed director of vocational education in that city by the board of vocational education recently.

Mr. Enge succeeds Sam G. Davey, recently appointed city superintendent of schools in place of A. T. Stolen, who accepted the post of superintendent for the schools of Duluth, Minn.

These appointments became effective August 1.

♦ FRANK G. BECK, supervisor of the war training program for the Vocational School, Eau Claire, Wis., since 1940, was appointed trade and industrial co-ordinator by the Board of Education. He succeeds W. L. Enge, who recently was named Vocational School director.

♦ AMMON SWOPE, associate professor of industrial education at Purdue University, Lafayette, Ind., has been teaching at the University of Missouri during the six weeks summer session. He conducted courses there formerly taught by the late Professor Selvidge.

♦ RICHARD F. BACH, dean of education at the Metropolitan Museum of Art, has been named chairman of the advisory council of the Cooper Union Art School for a two-year term. Mr. Bach succeeds J. Andre Fouilhoux, member of the architectural firm of Harrison, Fouilhoux, and Abramovitz and designer of the Trylon and Perisphere at the New York World's Fair, who will continue as a member of the council.

♦ The many friends of MAJOR WILLIAM E. WARNER may be glad to learn that he is a staff officer at Supreme Headquarters of the AEF and that he can be contacted by addressing him as: Major William E. Warner, O-532966, G-5, SHAEF, APO 757, % Postmaster, New York, N. Y.

♦ L. A. FERGUSON, formerly director of the Sturgeon Bay Vocational and Adult Education School, has been appointed director of the Beloit Vocational and Adult Education School, Beloit, Wis. He succeeds A. G. McCreary who retired recently.

Mr. Ferguson was director at Sturgeon Bay, Wis., for three years, and held a similar position at Niagara, Wis., for five years. He started the vocational schools in each of these two cities.

He holds a B.S. degree from The Stout Institute, Menomonie, Wis., and is working toward a master's degree at Colorado State College, Fort Collins, Colo.

RECEIVES DOCTOR'S DEGREE

J. Edgar Ray, teacher of architectural drafting and freehand drawing at The Stout Institute, Menomonie, Wis., is now Dr. J. Edgar Ray, having received his Doctor's degree in June, 1944, from New York University, New York.

Dr. Ray has had a broad training and experience. He is a graduate of Williamson Trade School (1908) where he specialized in bricklaying and architectural drafting. From 1908 to 1914 he worked as a journeyman bricklayer and foreman in New York, Pennsylvania, New Jersey, Florida, Texas, Louisiana, Arizona, California, Michigan, and Wisconsin.

From 1914 to 1927 he taught and had supervision of practice classes in the following subjects in The Stout Institute: bricklaying trade, concrete construction, elements of mechanical drawing, architectural drafting, freehand drawing, and machine drawing. He was a member of the Ludington Guard Band for many years, playing the trumpet.

From 1927 to 1930 he was the head of the drafting department at Waukegan Township High School, Waukegan, Ill., where he made some studies of teaching of drawing in high schools. He returned to The Stout Institute in 1930 to teach architectural drafting, freehand drawing, refresher courses in mechanical drafting, also bricklaying and supervision of training classes in those subjects.

Dr. Ray received his B.S. in industrial education from The Stout Institute, Menomonie, Wis., in 1922; and his M.S. in trades and industry from Iowa State College, Ames, Iowa in 1930. He is a member of Epsilon Pi Tau and Phi Delta Kappa.

♦ HOWARD ROUNDS, director of vocational education at Ottawa, Kans., for the past two years, has resigned his position and has gone to California where he expects to engage in teaching.

♦ RICHARD B. WARREN has been engaged by the Ann Arbor, Mich., board of education to succeed Edward Bailey as co-ordinator of apprentice and cooperative occupational training. Mr. Bailey has been assigned to work on the Wayne University program.

♦ JOHN GRIBBLE has been appointed machine-shop instructor at Ironwood, Mich. He replaces Elmer E. Miller who has been assigned to other work in connection with the trade and industrial education program.

♦ KENNETH L. BURCH, who has had several years' experience in private industry as a tool and diemaker, has accepted a position with the Ann Arbor, Mich., board of education as instructor of trade machine shop.

♦ Seward H. Foote, who was formerly teacher trainer in farm shop work at the Virginia Poly-

(Continued on page 30A)

.0005"

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(Continued from page 28A)

technic Institute, Blacksburg, Va., has accepted a position as agricultural field representative for the Portland Cement Association in New York State, which became effective July 1, 1944.

♦ ROY E. HEWEY, formerly of the Senior High School at Greenville, S. C., has been commissioned a Lt. (jg) in the U. S. Navy.

♦ HAROLD MCCLEAVE, who is a member of the Atchison, Kans., school system, has been named as director of the adult evening classes. Mr. McCleave has been teaching in the Fort Hays Kansas State College summer session.

♦ GEORGE FREY, on leave of absence from the staff of the State Board for Vocational Education of Kansas, has been promoted to the rank of corporal. He is now technician 5th grade.

♦ MURRAY LINCOLN MILLER is now Assistant Chief Draftsman for Taylorcraft Aviation Corporation, Alliance, Ohio. He entered industry because of a drastic decline in college student enrollment.

Mr. Miller was formerly supervisor of industrial arts education, Wilmington, Delaware; instructor, Lincoln School of Teachers College, Columbia University; member of the faculties of State Teachers Colleges at Indiana, Pa., and Slippery Rock, Pa., and one of the official chairmen of accrediting evaluations of the Middle States Assn. of Colleges and Secondary Schools.

♦ E. A. BYERLY has recently been named supervisor of industrial arts in the public schools of West Allis, Wis. He succeeds Mr. C. C. Carlson who is now the principal of Jefferson School in West Allis.

♦ E. H. THALMANN, formerly county agricultural agent, Franklin County, Nebr., has been appointed organization director of the Nebraska Farm Bureau Federation.

♦ DR. HOMER J. SMITH, Professor of Industrial Education, University of Minnesota, is participating in a comprehensive survey of the public schools of Battle Creek, Mich., which survey is being conducted by the Department of Education of the University of Chicago. Dr. Smith also spent the week of July 24 to 29 at Teachers College of Connecticut, New Britain, assisting with graduate seminars under the direction of Professor Raymond W. Phipps.

♦ ANNA LALOR BURDICK died in Washington, D. C., April 20, 1944, at the age of 74. From 1917 until her retirement in 1939 Mrs. Burdick was Agent for Trade and Industrial Education, Girls and Women, U. S. Office of Education.

Previous to entering the Office of Education, Mrs. Burdick taught in the Decorah (Iowa) High School; was principal of the high school, and superintendent of schools in Iowa Falls, Iowa; teacher of English in West High School, and Director of Vocational Guidance in Des Moines, Iowa.

♦ FRANCIS JOSEPH CHRIST, who had taught woodwork, mechanical drawing, and sheet-metal layout in the Hillsborough High School, Tampa, Fla., for 37 years before retiring in 1941, died at the age of 82 on May 21, 1944.

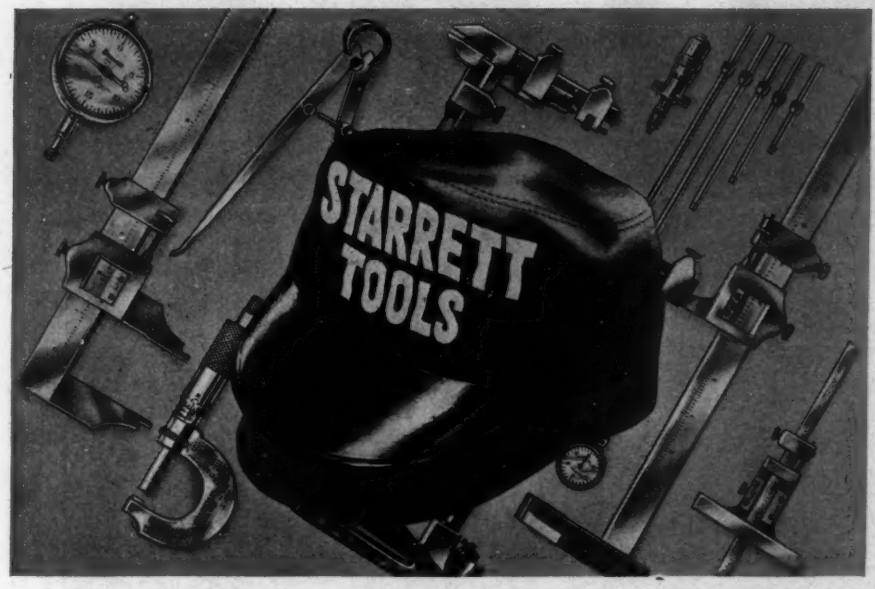
♦ LOUIS M. FLOWER, instructor of related science and mathematics, and supervisor of War Production Worker Training at Davis Vocational and Technical High School, Grand Rapids, Mich., died on February 28, 1944, after a short illness.

♦ RUDOLPH SANDES, a plumbing instructor at Boys' Trade and Technical high school, Milwaukee, Wis., for more than 15 years, died at his home recently after an illness of more than two years. He was a native Milwaukeean, and a graduate of the school in which he later taught. He also attended Marquette University, Milwaukee. Mr. Sandes is survived by his wife, Esther.

♦ THOMAS A. ROBERTS, who was an instructor in building trades at the Milwaukee Vocational School, Milwaukee, Wis., since 1928, died July 16, 1944, after a six week illness at veterans' hospital.

Mr. Roberts was a native of Ridgeway, Wis., and was graduated from Platteville State Teachers College. Before joining the vocational school staff he was active in the building trades in Madison, Wis. During World War I he served in France, and was a member of the Veterans of Foreign Wars. He was president of the Milwaukee Vocational School Teachers' Association, American Federation of Teachers. He is the author of a book on home estimating.

Mr. Roberts is survived by his wife, a daughter, three sons, and his mother, sister, and three brothers.



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Association News

♦ At the annual dinner meeting of the School Crafts Club of New York City, held at the Imperial Hotel, New York, on Saturday, May 20, the following officers were elected for the coming year.

President — Philip M. Wagner, acting director of the Newark Public School of Fine and Industrial Arts, Newark, N. J.

Vice-president — Loring J. Barker, industrial-arts teacher, High School, Orange, N. J.

Secretary — Ralph A. Carter, industrial-arts teacher, Hawkins St. School, Newark, N. J.

Treasurer — Charles G. Fischer, Board of Education, Brooklyn, N. Y.

At this meeting two former presidents of the Association announced their retirement from the teaching profession — Dr. E. Kent, supervisor of industrial arts, Jersey City, N. J., and Ed. Judd, teacher of industrial arts, High School, Montclair, N. J.

♦ The Annual Joint Convention of the Michigan Industrial Education Society, the Michigan Home Economics Association, the Michigan Distributive Educational Society, the Michigan Association of Teachers of Vocational Agriculture, and the Michigan Vocational Association was held at the Pantlind Hotel, Grand Rapids, Mich., on May 11, 12, and 13, 1944. The theme of all of the deliberations at this gathering

(Continued on page 32A)

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JACKEY and BARLOW
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Clearly explains all mathematical principles and procedures needed by machinists, carpenters, radio men and others in industry, the skilled trades and the Armed Forces, with many illustrative examples and 800 excellent problems for training. Contains especially fine sections on geometry and trigonometry. $2.00

THE CRAFTSMAN PREPARES TO TEACH

By Jackey & Barlow

Simple, clear directions for preparing the subject matter for and applying successful teaching techniques to all kinds of shop courses. Written by men who have been in charge of trade and industrial teacher-training in California, this book will be extremely helpful to any inexperienced shop teacher as well as for teacher-training courses. $2.00

Watch for these forthcoming books

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A companion volume to "Lathe Operations."

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All fundamentals, including the necessary math., with many problems.

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Unusually complete, fully illustrated. Explains commercial equipment now in use. Contains much useful material in appendices.

NOTE: These books are in great demand today. Early orders for the estimated number of copies needed for class use will greatly facilitate prompt deliveries. Examination copies will be sent to teachers upon request.

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(Continued from page 30A)

of the Michigan industrial arts and vocational education teachers was "Industrial Education for the Present and Postwar Era."

The first general meeting Thursday afternoon was conducted by George H. Fern, director, state board of control for vocational education, as chairman.

At this meeting a panel discussion on postwar planning was held. The members of the panel were Earl H. Babcock, chairman of the council, and superintendent of schools, Grand Haven; Sidney C. Mitchell, superintendent of schools, Benton Harbor; Warren Bow, superintendent of schools, Detroit; Russell LeCronier, superintendent of schools, Bad Axe; E. C. Russell, director of vocational education, Pontiac public schools; Herbert Carter, co-ordinator of apprentice training, Lapeer public schools; William E. Stirton, former director, vocational training for war production workers, Detroit; George B. Frazee, director of vocational education, Grand Rapids; and N. B. Giles, agent, trade and industrial education, U. S. Office of Education, Washington, D. C.

At the Thursday evening dinner Lynn Heatley, president, Michigan Vocational Association, was the chairman, and John A. McCarthy, president, American Vocational Association, and William Jesse Baird, dean, Foundation School, Berea College, Kentucky, were the speakers.

Andrew D. Althouse, president, Michigan Industrial Education Society, was chairman of the general session on Friday morning. Arthur B. Mays, professor of industrial education, University of Illinois, gave a well-outlined and thoughtful address on the "Relation of Industrial Arts to Trade and Industrial Education." He discussed the early history of both types of practical education, their differences and similarities, and showed that manual training — now industrial arts — was based on psychological bases, while vocational education was founded on an economical basis.

The one was a part of general education although it had vocational implications, while the other was definitely vocational.

Industrial arts is definitely necessary in our modern industrial age because it is the only part of our general education which prepares the student to fit intelligently into his industrial environment.

Vocational education, on the other hand, makes the student skillful on the vocational level so that he can intelligently work in an industrial environment.

Both are basically needed in modern education and they belong together and should be together in local, state, and national associations.

A panel consisting of Dr. Frank Dalton, University of Michigan; Milton J. Hoffer, Rogers City; Archie Nevins, Kalamazoo; Lester Orcutt, Mt. Pleasant; G. H. Silvius, Wayne University; Arthur L. Reagh, Grand Rapids; and H. J. Van Westrienen, Lansing, then discussed the topic.

The Town Hall Meeting was under the chairmanship of Earl L. Bedell, divisional director, vocational education, Detroit. The topic discussed was "Vital Problems in Vocational Education." The discussion panel consisted of Frederick Searle, superintendent, Ford Industrial Schools, Dearborn; Floyd Allen, director of vocational education, Saginaw; John W. Gibson, president, Michigan Council, C.I.O.; John A. McCarthy; Frank Carpenter, principal, Wilbur Wright High School, Detroit; and Maurice Pancost, principal, Technical High School, Lansing. A lively exchange between panel members and audience ensued.

The industrial arts education meeting Friday afternoon was presided over by Milton Hoffer. The speaker on this occasion again was Arthur B. Mays. In his discussion of "New Industrial Arts for a New Day," he showed that great national crises, such as wars and depressions, always have great influence on education. The Smith Hughes Law was an outgrowth of World War I, while the present war will be followed by a change in industrial arts.

In the "new day" much more will be expected and asked from the student. Great developments in industry, its materials, and the processes it employs have been stimulated by the war. The young men who have entered the army have obtained a new concept of physics and its applications and they will come back with a much greater respect for vocational education.

The "new day" will emphasize the growing importance of skill, sound work habits, and constructive and analytical thinking.

Prof. William Kynock, School of Forestry and Conservation, University of Michigan, in his address on "New Materials in Industry" showed how wood which was thought to be on its way out has been really shoved into the forefront by World War II. Not only is wood used to a large extent in putting up barracks, factories, and worker's homes, but it furnishes the wherewithal for making clothing, blankets, lubricating oils, plastics, and explosives, and it frequently displaces metal.

Chemically it may soon outrank coal and petroleum and out of it fuel oil and gasoline and alcohol can be made, to say nothing of the new types of resin impregnated plywoods which are now being supplied.

At the dinner, Friday evening, Andrew D. Althouse presided; and Arthur W. Krause, superintendent of schools, Grand Rapids, acted as toastmaster.

On this occasion the Michigan Industrial Education Society conferred a life membership on George B. Frazee, for the outstanding contributions which he has made to industrial education.

The chief address was given by Major Clark Hopkins, Chief, School Branch, 6th Service Command, U. S. Army. He emphasized that America should do away with fears and lamentations and that we should look forward confidently. If the problems ahead look large and insoluble, rejoice because that makes them worthy of our mettle.

We have many opportunities, duties, and privileges. We have waste lands that we can develop, soils to improve, rivers and streams that

(Continued on page 34A)

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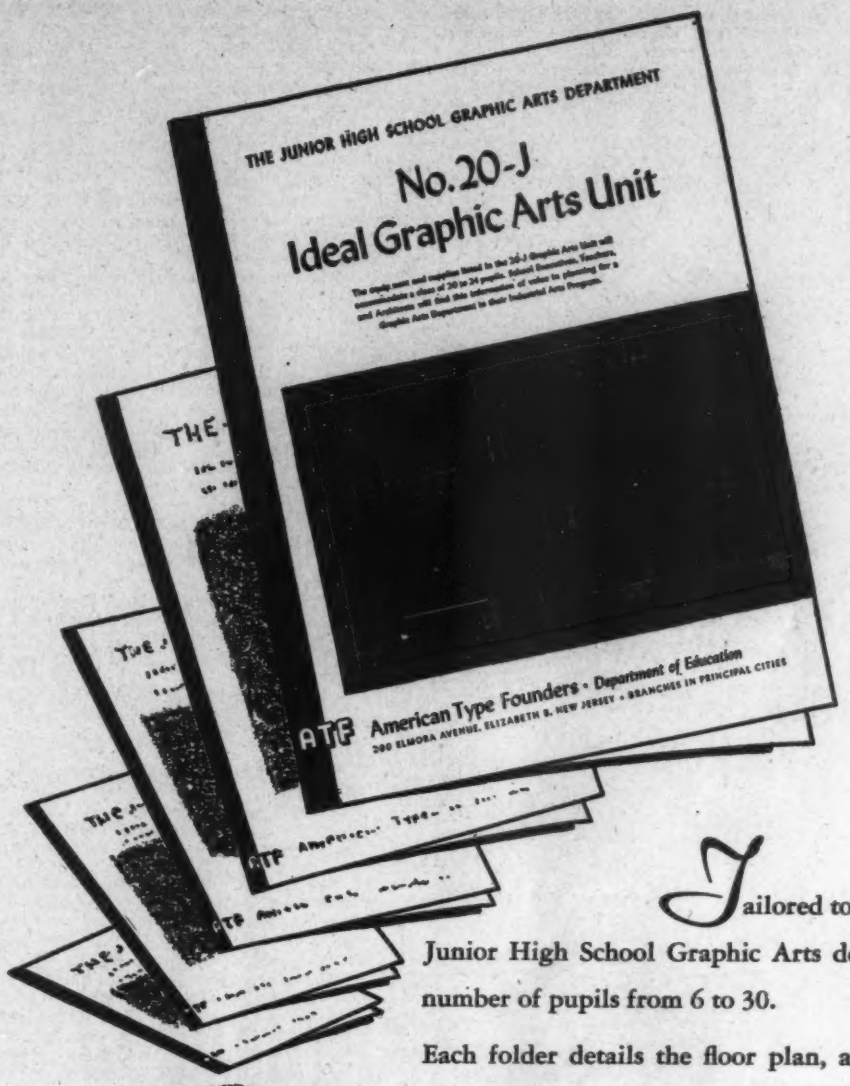
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EDUCATION DEPARTMENT

American Type Founders

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(Continued from page 32A)

need improvements, slums that must be cleaned up, educational standards that need to be raised, and above all, we need faith, confidence, and the will to struggle on.

Saturday morning, May 13, at 7:30, a joint breakfast was held by Mu Sigma Pi, Iota Lambda Sigma, and Epsilon Pi Tau.

At 9:00 a.m., "Industrial Education in the Postwar Era" was the subject of discussion by a panel. The chairman of the meeting was Archie Nevins, vice-president, Michigan Industrial Education Society; and the panel leader was John McCarthy. The chairman of Research Committee and guest speakers were the members of the panel. Dr. Arthur B. Mays summarized the findings.

At the Ship's luncheon held Saturday at 12:30 noon John Amiss, representative-at-large, Michigan Vocational Association, and director of industrial education, Chrysler Corporation, was chairman; and Warren Bow, superintendent of schools, Detroit, acted as toastmaster.

Ed Fielder, manager, Committee on Economic Development for Michigan, in speaking on the subject "We're All in the Same Boat," outlined the gigantic task which confronts all Americans, so that our government as Abraham Lincoln expressed it in his Gettysburg address ". . . of the people, by the people, for the people shall not perish from the earth."

The Ship's program was then put on with Charlie Roper, McKnight & McKnight, as captain and Armen Kurkjian, Oliver Machinery Company, Grand Rapids, as deck officer.

The officers elected for the coming year are: president, Archie Nevins, Kalamazoo; vice-president, Floyd Allen, Saginaw; and executive secretary-treasurer, Arthur L. Reagh, Grand Rapids.

♦ The American Industrial Arts Association held an executive conference on May 20, 1944, at Hotel Pennsylvania, New York City.

President Everett J. McIntosh of Massachusetts presided. A report by Allen D. Backus of New Jersey, chairman of the editorial and publications board, was then presented and discussed.

Secretary John J. Hatch of New Jersey then presented a brief report relative to the history of the A.I.A.A., since its organization in Cleveland, Ohio, in 1939.

Dr. John R. Ludington of North Carolina, chairman of the curriculum committee, reported on the plans that have been projected for the coming year.

Policies with reference to future issues of "The Industrial Arts Teacher" were then discussed.

At the afternoon session Dr. Burl N. Osburn, director of industrial arts, State Teachers College, Millersville, Pa., urged that in anticipation of the broad expansion of industrial-arts education in the postwar era, every effort should be made to attract a wider membership. He was followed by Frank C. Moore, director of industrial arts, Cleveland, Ohio, who gave an address on the outlook and probable development in industrial-arts education of the future.

At the business meeting Paul E. Harrison, Northern Illinois State Teachers College, DeKalb, Ill., was elected as president for the coming year. John J. Hatch will continue as secretary of the association.

♦ The Nebraska Vocational Agriculture Association held its annual convention June 1, 2, and 3, 1944, at Lincoln, Nebr.

The following were elected as officers for the coming year:

Herbert Hartley, McCook, Nebr., president; Dexter Haws, Lyons, Nebr., vice-president; and M. G. McCreigh, Elkhorn, Nebr., secretary-treasurer.

The following were elected as district chairmen: Harvey Seng, Lewiston, Nebr.; William Friesen, Crete; Alfred Mathis, Wisner; Ralph Benton, Columbus; Harold Stevens, Sargent; Ralph Vose, Cozad; Gerald Yaw, Imperial; and Jim Wall, Crawford.

The annual district meetings will be held in August at the following places: District No. 1, Beatrice, Nebr.; No. 2, Crete; No. 3, Fremont; No. 4, Albion; No. 5, Ord; No. 6, Kearney; No. 7, Bridgeport; and No. 8, Alliance.

The new officers elected for the ten-year club of the Nebraska Vocational Agriculture Teachers Association are: Harvey Seng, Lewiston, Nebr., president; John Webb, Big Springs, vice-president; and L. B. Neumann, Sidney, secretary.

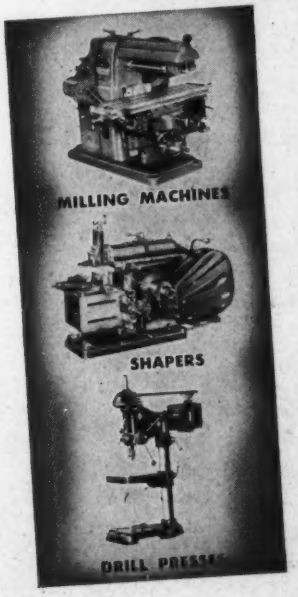
♦ Meetings of the Council and Executive Board of the American Library Association will be held in the Drake Hotel, Chicago, October 12–14, 1944. The meetings are called to consider and vote upon questions of importance connected with the wartime services of libraries. In line with ODT requests, general conferences have been canceled for the duration.

♦ The Mechanical Drawing Association of New England held a meeting on May 20 at Northeastern University, Boston, Mass. The members of the association were addressed by Prof. John T. Rule, M.I.T., Head of the Department of Graphics, at Cambridge, Mass., on the subject of "Tape Drawing." In substance, it concerns a new technique for the drawing room that introduces an increased accuracy and cuts the time of tracing drawings to one-quarter of that previously required. Prof. Rule is a consultant with The Polaroid Company.

Mr. Edward H. Cameron, M. Am. Soc. C.E., associated with Jackson & Moreland, Engineers, Boston, Mass., discussed "The Draftsman at War," and Mr. John P. McGrail, state supervisor of industrial and engineering courses of University Extension, State Department of Education, spoke on "Education Plans for the Future."

♦ The annual dinner meeting of the Peninsula Industrial Education Club of Virginia was held at seven o'clock, May 5, in the cafeteria of the Hampton High School, Hampton, Va. Guests were present from the Richmond public schools, the state department of education, Newport News public schools, Portsmouth, Norfolk and

(Continued on page 36A)



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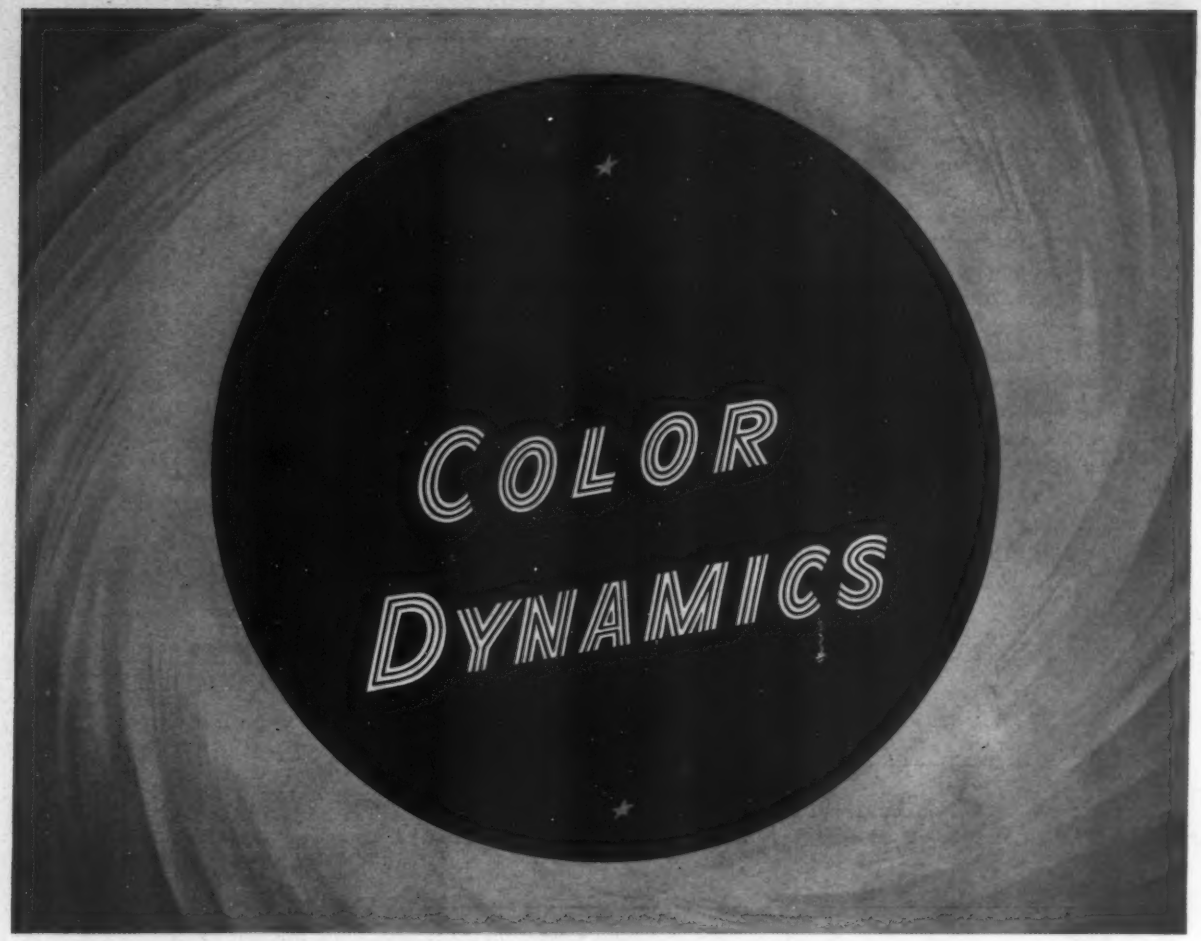

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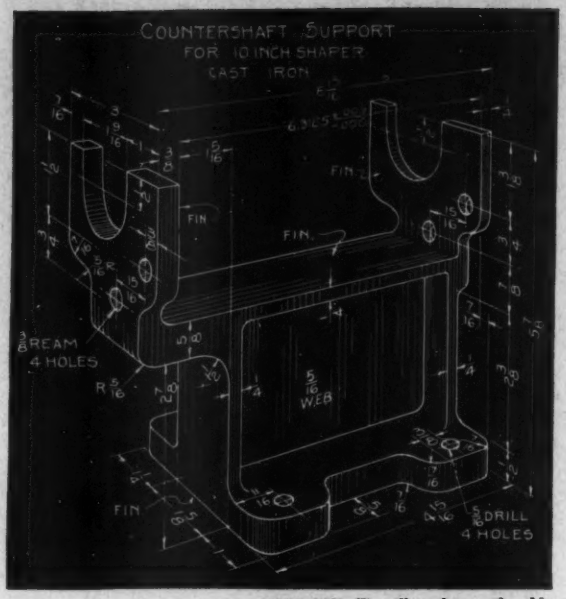

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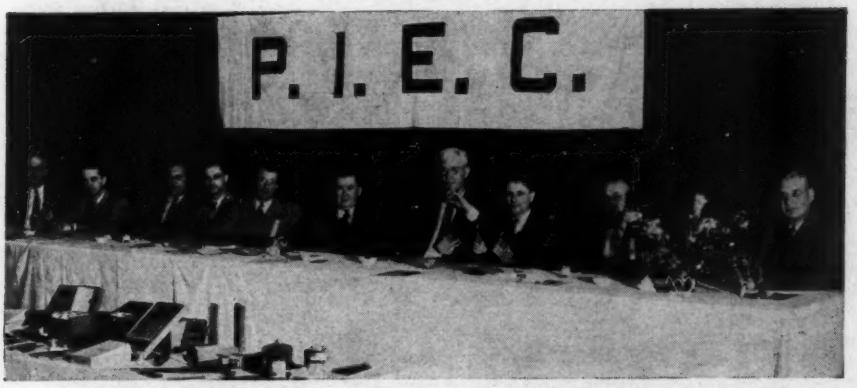


Speakers' table at Peninsula Industrial Education Club of Virginia Convention. Left to right: H. D. Green, assistant superintendent of schools, Newport News, Va.; Charles A. Hulcher, director of Apprentice School, National Advisory Committee on Aeronautics, Langley Field, Va.; Linscott Ballentine, acting director of vocational education, State Department of Education, Richmond, Va.; Joseph A. Schad, president of Virginia Vocational Association, Newport News, Va.; John L. Frank, president of Peninsula Industrial Education Club, Hampton, Va.; John A. McCarthy, president of American Vocational Association — speaker of the evening; Dr. B. H. Van Oot, director of war-production training, State Department of Education, Richmond, Va.; Alton C. Lindsay, county superintendent of schools, Elizabeth City County, Hampton, Va.; E. H. Bentzel, superintendent of buildings, Hampton Institute, Hampton, Va.; and C. Earl Heddin, specialists in conference leader training, State Department of Education, Richmond, Va.

(Continued from page 34A)

Hampton public schools, the Naval Air station, Langley Field and Hampton Institute.

The welcome address was given by Joseph A. Schad, president of the Virginia Vocational Association, and director of industrial education in the city schools of Newport News.

The principal speaker was John A. McCarthy, president of the American Vocational Association, and director of vocational education for New Jersey.

News Notes

♦ A Memorial Service in memory of those vocational school students who made the supreme sacrifice in World War II was conducted on May 29, 1944 at the Milwaukee Vocational School, Milwaukee, Wis. Those participating in the program included Dr. William F. Rasche, director and principal of the school; Rev. Fr. Celestine Bittle, O.M.Cap., of St. Benedict the Moor Mission, Milwaukee, and Past State Chaplain, American Legion, and State Chaplain of 40/8; Rev. Dr. Gustav Stearns, D.D., Protestant Chaplain, Veterans' Home, Wood, Wis., and National Chaplain, Military Order of the Purple Heart; and Mr. Herman Geske, Milwaukee Vocational School Faculty, and State Chaplain, Army and Navy Union, U.S.A.

The program opened with a prelude by Miss Ruth Dunham, followed by the posting of the colors by Company M, First Regiment, Wisconsin State Guard. Father Bittle gave the invocation, after which Dr. Rasche made the presentation of the school memorial. The Milwaukee Vocational School Teachers' Chorus rendered several numbers, and Mr. Geske delivered an address on "The Commemoration of the Dead." The Rev. Dr. Stearns conducted the prayer and benediction. This was followed by the singing of The National Anthem, and Taps.

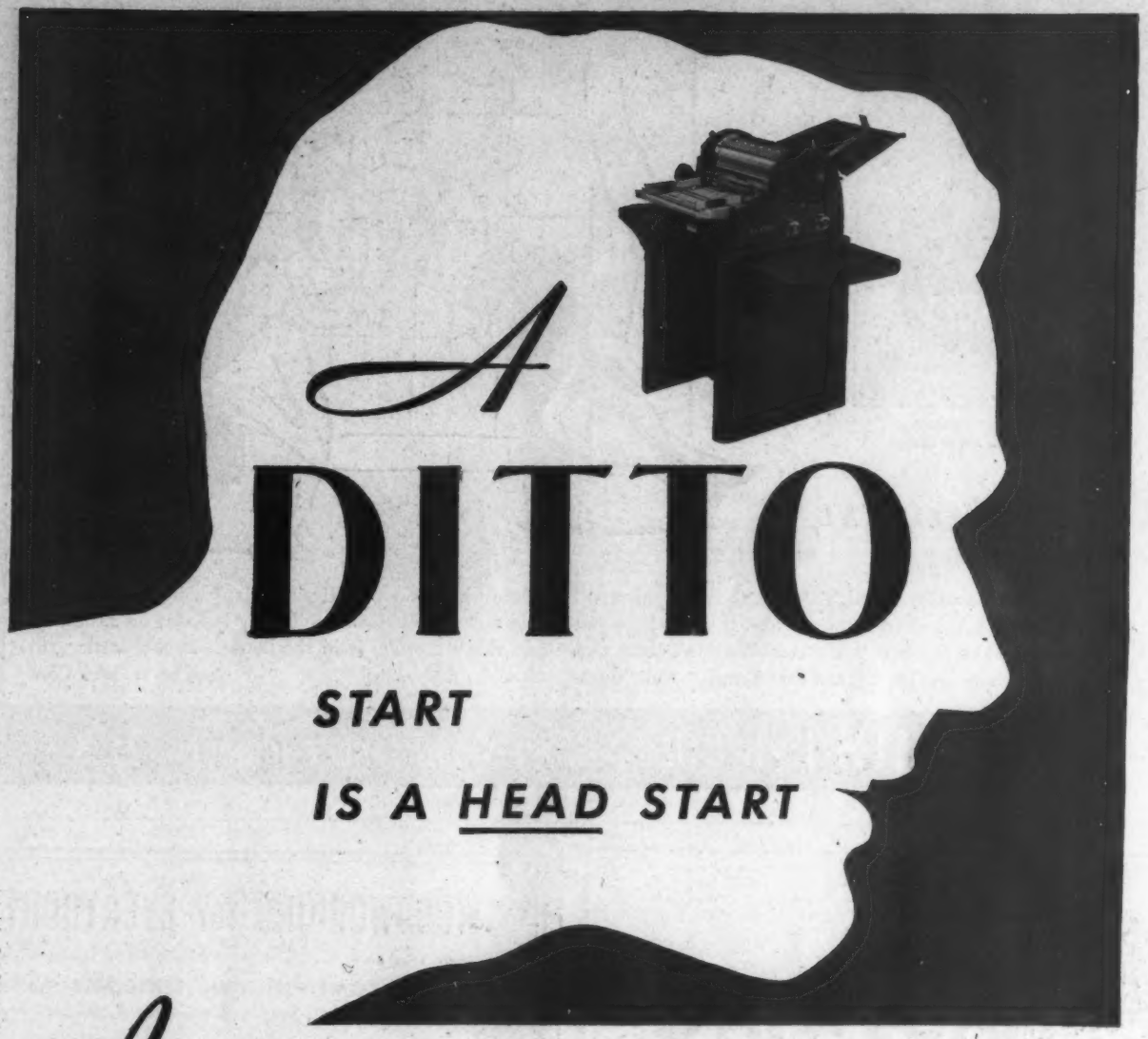
♦ A total of 4212 apprentices were at work in Wisconsin industry at the close of June, a gain of 34 over the previous month, according to Walter F. Simon, supervisor of apprenticeship for the industrial commission.

New apprentices in June numbered 97, while two transferred to other work, one was reinstated, 44 were suspended, 34 completed their courses, and 29 were canceled.

In connection with suspensions, Mr. Simon pointed out to employers that among returning servicemen are apprentices whose indentures were suspended when they went off to service. These men, when they return, are eligible to resume their training.

♦ Caracas, Venezuela, according to A. Pardo Soublette, is opening a handicrafts center. It will be the first of its kind to be started in Venezuela.

♦ Detroit, Mich., has a new part-time trade extension program for optical lens grinding apprentices.



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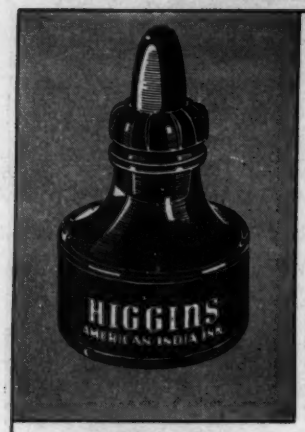

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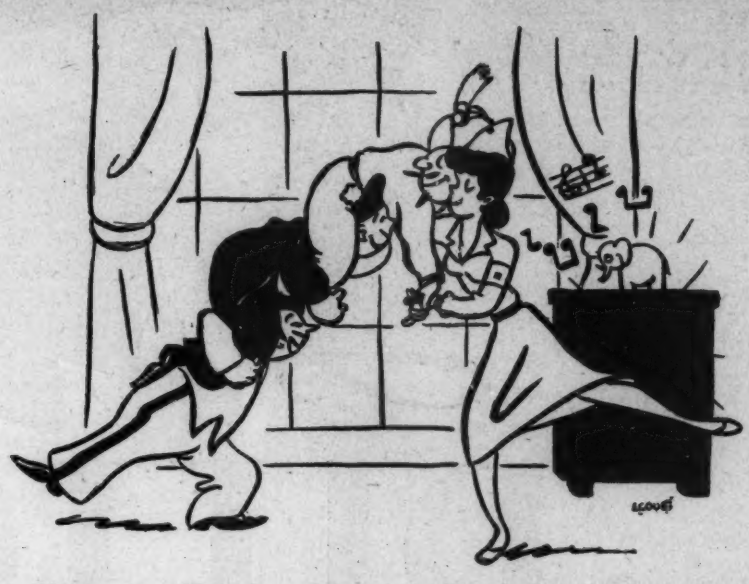

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A.: The translation of aviation terms is as follows:

1. Engine cowling—Tolva de motor
2. Engine—Motor
3. Red guide light—Luz roja de navegación
4. Inboard wing section (this is not in accordance with conventional aviation terms; it is rightfully the center section wing)—Sección central de ala
5. Engine nacelle—Barquilla de motor
6. Wing flap—Aleta o freno aerodinámico
7. Fillet—Nervio o filete
8. Center line of thrust (simply known as thrust line)—Linea o eje de tracción
9. Horizontal stabilizer—Estabilizador o plano horizontal
10. Elevators—Elevador o timón de profundidad
11. Trimming edge (better known as trim tabs)—Aleta compensadora
12. White taillight—Luz de cola o luz blanca de navegación.
13. Rudder—Timón o timón de dirección
14. Fuselage—Fuselaje
15. Green guide light—Luz verde de navegación
16. Wing tip—Punta de ala
17. Leading edge—Borde de entrada
18. Trailing edge—Borde de salida
19. Aileron—Alerón
20. Center wing section (according to conventional terms, this is the wing outer panel)—Ala
21. Spinner—Cono de ja hélice
22. Propeller—Hélice
23. Nose—Nariz o proa del fuselaje

—*J. F. W.*

New Publications

Ben Hunt's Whittling Book

Cloth, 111 pages, 7 by 10½ in., illustrated. Price, $2.50. The Bruce Publishing Co., 540 N. Milwaukee St., Milwaukee 1, Wis.

A book that will delight young and old. It is written for the beginner as well as for the whittling expert, and is especially appropriate for the boy scout.

The author gives concise but clear directions for selecting, sharpening, and using knives. He also discusses the woods to be used.

Then he illustrates and explains how to whittle upward of 40 of the most interesting birds, penguins, pins, brooches, belts, necklaces, bracelets, zipper pulls, buttons, neckerchief slides, katcina dolls, totem poles, and several kinds of animals.

All of the sketches have been drawn so that they may be used as full-size patterns. The beginner has to do nothing else than to furnish a knife, pick out what he is going to whittle, find a suitable piece of wood, and then carefully read and patiently follow directions. Success and deep satisfaction will follow.

McCarthy of Wisconsin

By Edward A. Fitzpatrick. Cloth, 316 pages, 6¼ by 9¼ in. Price, $3.50. Columbia University Press, New York City.

An interesting biography of a man whose life should be known to everyone interested in industrial arts and vocational education.

As one reads through this biography, it becomes apparent that the author thoroughly enjoyed writing about his subject. Furthermore, the reader will quickly agree that Charles McCarthy's life is worthy of the best efforts of any writer.

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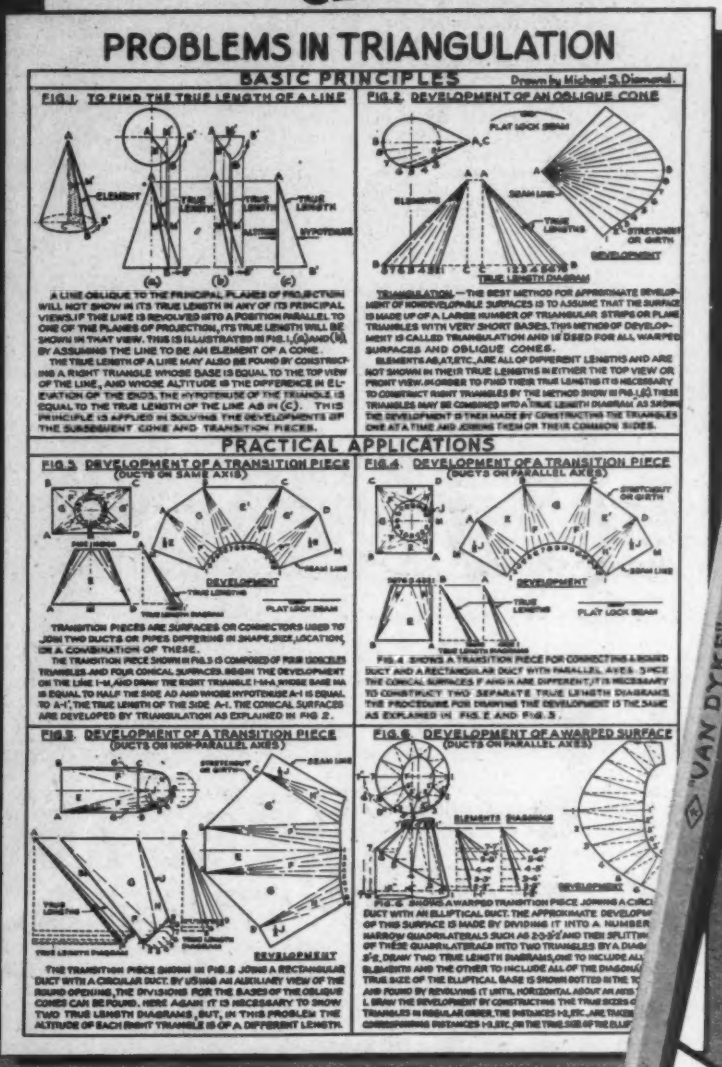
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Drawn by Michael S. Diamond.
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FIG. 2. DEVELOPMENT OF AN OBLIQUE CONE
PRACTICAL APPLICATIONS
FIG. 3. DEVELOPMENT OF A TRANSITION PIECE (DUCTS ON SAME AXIS)
FIG. 4. DEVELOPMENT OF A TRANSITION PIECE (DUCTS ON PARALLEL AXES)
FIG. 5. DEVELOPMENT OF A TRANSITION PIECE (DUCTS ON NON-PARALLEL AXES)
FIG. 6. DEVELOPMENT OF A WARPED SURFACE (DUCTS ON PARALLEL AXES)
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Fitzpatrick's sympathetically written life of this great man ought to be a *must* for every vocational teacher in America.

Aircraft Mechanics Handbook

Edited by Paul Van Winkle. Cloth, 400 pages, 5¼ by 7½ in. Price, $2.75. The Manual Arts Press, Peoria 3, Ill.

A very comprehensive handbook for the aircraft mechanic.

The book is divided into 16 sections in which are discussed: aluminum and its alloys; riveting; bending; AN parts; special fasteners; nomenclature; mathematics; drafting terms, symbols, and abbreviations; welding; basic metalwork; steels; woodwork; cable and splicing; plastics; fabric work; and protective coatings.

The material is well illustrated, and each section has its own table of contents. Besides these tables of contents, there is a general index to make reference to any subject as easy as possible.

Wood Rasp Carving

By Louis J. Haas. Sixteen paper-bound plates, 7 by 9¾ in. Price, 80 cents. Published by Louis J. Haas, White Plains, N. Y.

A description of an interesting new method of carving in which files and rasps replace the customary cutting tools with pleasing and thoroughly satisfying results.

The method of using the files and rasps is clearly explained and the illustrations clarify the various operations so well that the veriest beginner should have little trouble.

The projects shown are all excellently designed and each one is presented in a number of patterns from which a choice can be made.

Soybean Chemistry and Technology

By Klare S. Markley and Warren H. Goss. Cloth, 261 pages, 5¾ by 8¾ in. Price, $3.50. The Chemical Publishing Co., Inc., 234 King St., Brooklyn, N. Y.

The soybean, once an insignificant crop here in America, has produced 209 million bushels last year.

It is steadily becoming better known in the field of foods for man and beast, and has assumed a prominent area in the industrial world.

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Laboratory Manual in Radio

By Francis E. Almstead, Kirke E. Davis, and George K. Stone. Paper, 139 pages, 6 by 9 in., illustrated. Price, 80 cents. McGraw-Hill Book Co., Inc., New York City.

A manual for the student of radio, instructing him in the use of the needed tools; the recognition of circuits, and how to study, perform experiments, and make tests, on vacuum tubes, rectifiers, coils, condensers, antennas, and the like.

Design This Day

By Walter Dorwin Teague. Cloth, 291 pages, 7¼ by 9½ in., illustrated. Price, $6. Harcourt, Brace and Co., New York, N. Y.

This book is a discussion of the techniques, standards, and methods to be employed in rebuilding this chaotic world of ours in terms of our present mechanistic age.

The designer-author has done an especially fine job in his chapters on sources of form, fitness to function, fitness to materials, fitness to techniques, unity, simplicity, rhythmic relationships, rhythm of proportion, and rhythm of line and form.

Maintenance and Servicing of Electrical Instruments

By James Spencer. Cloth, 256 pages, 5 by 8¼ in., illustrated. Price, $2. Published by The Instruments Publishing Co., Inc., 1117 Wolfendals St., Pittsburgh, Pa.

An exceedingly useful book for schools, industry, and other users of electrical instruments.

The subject matter explains quite thoroughly what tools are needed; how to make mechanical and electrical adjustments on d.c. and a.c. ammeters, voltmeters, wattmeters, frequency meters, synchroscopes, power factor meters, re-

(Continued on page 49A)

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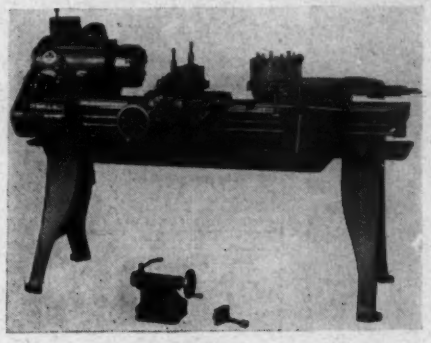
New Products — Publications

LEBLOND REGAL RAM TYPE BED TURRET

A hexagon bed turret is now supplied on the 13-in. and 15-in. Regal Lathes. The exceptionally large turret, 9 in. across faces, is available with power feed or hand feed only. The six station head is supported on double preloaded adjustable precision roller bearings. The turret is automatically indexed to the next station when the ram is returned against the indexing trip by the pilot wheel, or it can be spun by hand to any face of the turret in either direction. The forward feeding motion of the ram is automatically disengaged when the stop screws move against the



trip. The total length of travel of the ram with either hand, or power feed, is 6¼ in., and the bored hole in the face is 1 in. The drive for the turret apron is taken from the feed rod; thus the full range of feeds (.0025 to .144) is available and selected quickly by the quick change feed box. The apron is similar in design and has all the advantages of the regular carriage apron, including positive feed, and automatic forced lubrication. A safety device on the feed rod releases the feed when the pressure put on the tool is too great, or when some obstruction gets in the way of the forward movement of the ram.

The turret will take No. 2 tools, projecting 9½ in. For more specific information, address the R. K. LeBlond Machine Tool Co., Cincinnati 8, Ohio.

For brief reference use IAVE—710.

AUXILIARY LENS TO INCREASE MAGNIFICATION

Stanley Electric Tools, New Britain, Conn., offers an attachment for the "Flud-Lite" Magnifiers Nos. 701 and 701H—an auxiliary lens, No. 05, which doubles the magnifying power of the popular Stanley inspection tools, equipped

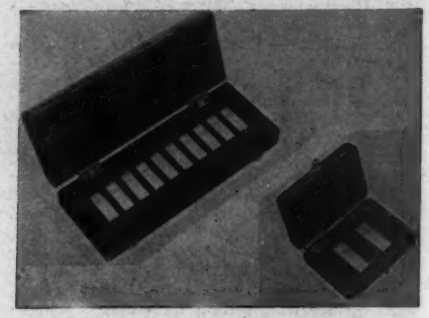
with fluorescent lamps. Use of the auxiliary lens is recommended for close inspection work and assembly of small parts whenever additional magnification is required.

The lens is 2½ in. in diameter and is set in a cup-shaped frame. Fits easily right under lens frame of magnifier and can be attached or removed in a few seconds' time. No. 05 Auxiliary Lens will fit any Stanley "Flud-Lite" Magnifier No. 701 or No. 701H.

For brief reference use IAVE—711.

WEAR RESISTING GAGE BLOCKS

Three all-carbide Gage Blocks sets are being offered by The Jansson Gage Company, 19208 Glendale Ave., Detroit 23, Mich. Made of tough, wear-resistant tungsten carbide, these blocks are held to extremely close limits, often well within claimed tolerances. The blocks are available in



Wear resisting gage blocks

sets of ten, two, and two, respectively, and one set of 81 steel blocks with two .050-in. tungsten carbide wear blocks. The Jansson ten-block carbide set ranges in size from .050 in. to .0509 in. in steps of .0001 in. The two smaller sets are intended primarily to be used as wear blocks with steel gage blocks. One contains two .050-in. blocks; the other contains two 100-in. blocks.

For further details on these and other items in the Jansson line of precision products, write to the manufacturer.

For brief reference use IAVE—712.

COMPARATORS WITH FOUR MAGNIFICATION RANGES

Continental Machines, Inc., manufacturers of DoAll precision gauges and instruments, now offer a complete line of DoAll comparators. The basic feature of the new DoAll comparator is its wide range of magnification, which enables one comparator to do the work which formerly required as many as four standard comparators. To accomplish this feature, each DoAll comparator has four magnification ranges, enabling work to be checked over a wide range of tolerances.

Many other features are included in the exceptional design of this instrument. The comparator is offered in three models, each having four ranges of magnification. The Model 10 measures variations of from one millionth to four

(Continued on page 43A)

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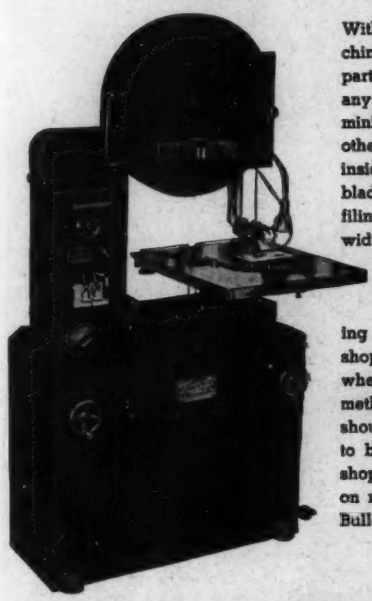
Most Essential Requirement for Your Machine Shop!



With this extremely versatile machine, tools and dies, machine parts or other items of practically any shape may be made in the minimum of time from steel or any other material; for it provides for inside and outside sawing, using blades 3/32" to ½" wide, chain filing — in three different file widths, and endless belt polishing. Because of this great versatility as well as the fact that these machines are being widely used in machine shops throughout the country where they are obsoleting other methods, a TANNEWITZ DI-SAW should be the number one item to be purchased for your school shop. Complete details furnished on request. Just ask for DI-SAW Bulletin.

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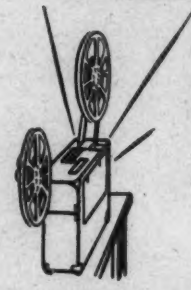

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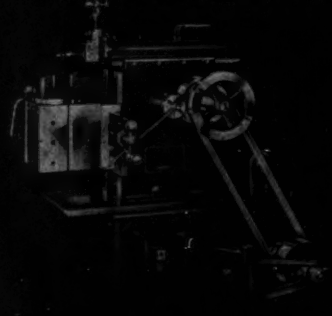

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Girls are rapidly becoming an important factor in War Industries, especially on production of intricate parts and pieces. Thousands of DI-ACRO machines are in use for such work. The ease of operation of DI-ACRO Units makes them ideal for use by girls.

BRAKES

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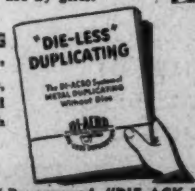

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O'NEIL-IRWIN MFG. CO.

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(Continued from page 40A)

hundred millionth inches; Model 20, from ten millionths to four thousandths inches; and Model 30, from fifty millionths to twenty thousandths. They operate on 110 volt, 60 cycle, a.c. current, and are protected so that accidental plugging into a d.c. current outlet will not damage the comparator.

Complete information and specifications on the DoAll Comparator are available from Continental Machines, Inc., 1301 Washington Avenue South, Minneapolis 4, Minn.

For brief reference use IAVE—713.

HOW TO OBTAIN POWER TOOLS

A convenient purchase plan for forward-looking shopmen and home craftsmen who need shop tools but have been unable to obtain them because of priority restrictions has been announced by Boice-Crane Co., 932 Central Ave., Toledo 6, Ohio, manufacturer of power tools.

By the Boice-Crane purchase priority plan, machine tools may be obtained at the earliest possible moment and payment arranged out of patriotic savings in war bonds.

A booklet describing the plan, together with new literature on the Boice-Crane line of band saws, saw jointers, jig saws, belt sanders, spindle sanders, spindle shapers, drill presses, lathes and thickness planers, will be sent to interested persons.

For brief reference use IAVE—714.

MEASURING THE ROUGHNESS OF SURFACES

The second edition of *Practical Surface-Roughness Measurement* has just been published by Physicists Research Company, makers of the Profilometer. This completely revised booklet contains information on surface roughness and its measurement, and describes the complete line of Profilometer roughness-gauging equipment.

The 12-page illustrated booklet is standard letter-file size, and lists specifications and prices of all Profilometer units and accessories. Copies may be had free by addressing Physicists Research Company, 343 S. Main St., Ann Arbor, Mich.

For brief reference use IAVE—715.

A BOOKLET ON THE PIONEERS IN RADIONICS

"Trail Blazers to Radionics and Reference Guide to Ultra High Frequencies," compiled by Miss Elizabeth Kelsey, was published by Zenith Radio Corporation, Chicago, Ill.

This book contains a bibliography on ultra high frequency research, and also a section which comprises brief biographical sketches of the great men of science who have contributed, directly or basically, to the development of radionics in all of its branches. A copy of the book may be obtained free of charge by addressing E. Kelsey, Zenith Radio Corp., 680 North Michigan Ave., Chicago 11, Ill.

For brief reference use IAVE—716.

HENRY C. ATKINS, SR., DIES

Henry C. Atkins, Sr., internationally known industrialist and leader in civic and character-building activities in Indianapolis, Ind., died June 15, following an illness of several months.

H. C. Atkins

Mr. Atkins had served as president of the E. C. Atkins and Company, saw manufacturers, since 1901. He was born at Atlanta, Idaho Territory, in November, 1868, and moved to Indianapolis as a lad with his parents. Here his father founded E. C. Atkins and Company. The late Mr. Atkins entered his father's business, after completing his studies at Yale University, as superintendent of the plant. In 1892 he was elected vice-president, and in 1901 was elevated to the presidency of the company.

Mr. Atkins is survived by his widow, three sons — Elias C. Atkins, Keyes W. Atkins, and Henry C. Atkins, Jr. — and seven grandchildren.

ATKINS AND COMPANY ELECTS PRESIDENT

E. C. Atkins and Company announces the election of new officers, following the death of the late H. C. Atkins.

Mr. Elias C. Atkins was elected president of the company, to succeed his father, after having served as first vice-president of the firm since 1936.

Another son, Mr. Keyes W. Atkins, formerly vice-president and general sales manager, covering all sales, both domestic and foreign, was elected as first vice-president in charge of sales.

Other officers of the company are William A. Atkins, vice-president; Frank R. Weaver, vice-president; Henry C. Atkins, superintendent; and Donald H. Potter, secretary and treasurer. Mr. Potter was elected to the Board of Directors to fill the vacancy left by the late Henry C. Atkins.

CHICAGO WHEEL ELECTS PRESIDENT

Arthur J. Miller has been elected president of the Chicago Wheel and Manufacturing Co., producers of mounted wheels, grinding wheels, and allied abrasive products. He replaces his father, the late Henry E. Miller, who founded the company in 1894.

Associated with Mr. Miller in the Chicago Wheel and Manufacturing Co., are Irving Danielson, vice-president; A. J. Miller, Jr., treasurer; and Arthur T. Dalton, secretary and sales manager.

It means, in this case, that there are tens of thousands of Crescent Woodworking Machines in daily operation all over the country in every type of industry. It is significant because your students are very likely to be called upon to operate a Crescent Woodworking Machine after you have trained them. Significant, also, is the fact that the highest type of production standards have always been rigidly observed enabling Crescent Woodworking Machines to enjoy the continued confidence of both the woodworking industry and vocational instructors. Still another point is the low maintenance cost of Crescent equipment. (The all-time average replacement cost is less than 5 cents per month, per machine!) In addition the product of a fifty year concern has the advantage of highly developed engineering knowledge from which stems greater accuracy, advanced safety devices, and many other desirable features. You can always choose Crescent equipment with the utmost confidence in their quality, safety and their ability to help you provide a more thorough training program.

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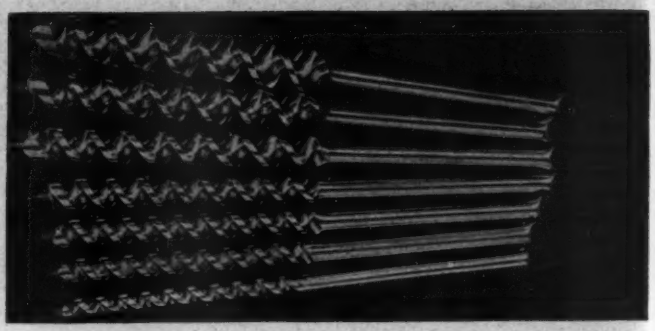

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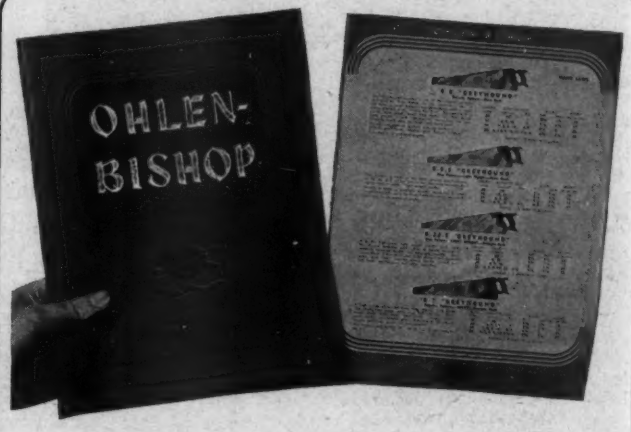

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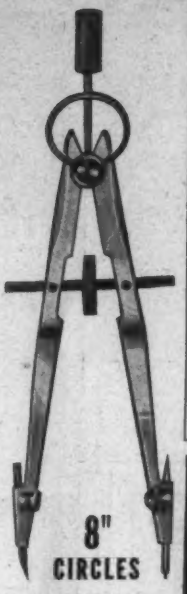

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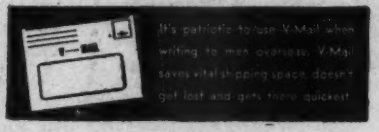
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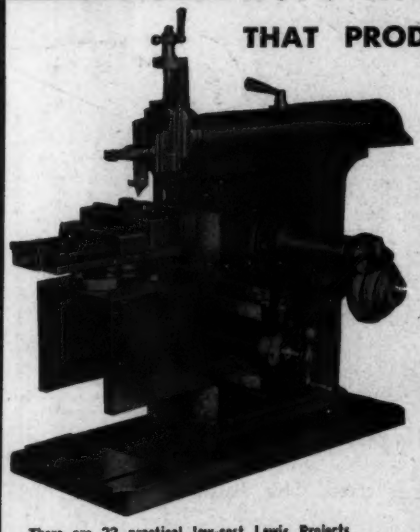

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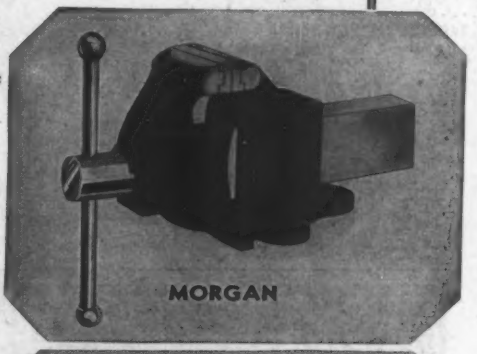

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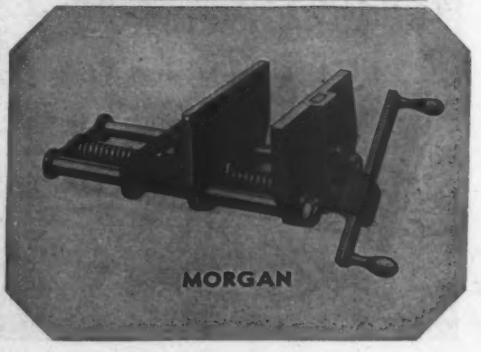

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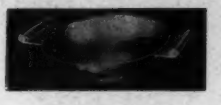

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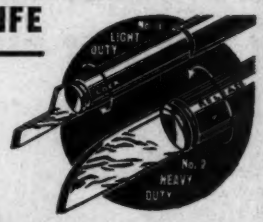

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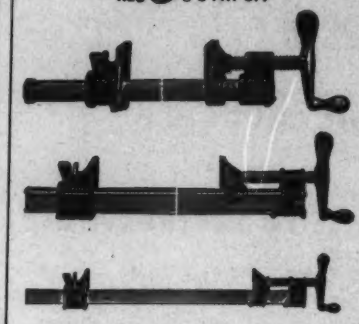

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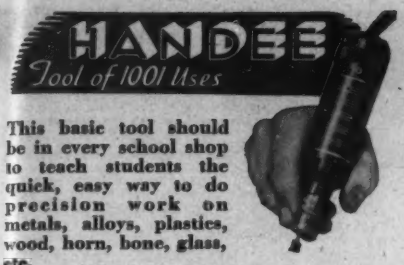

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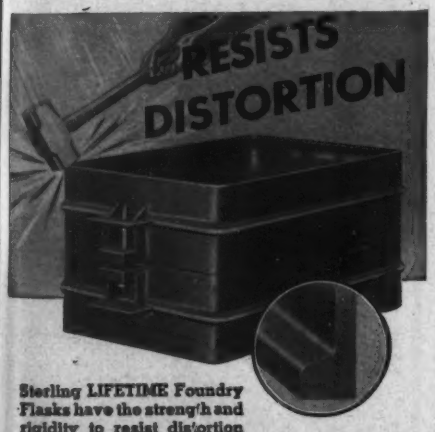

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(Continued from page 40A)

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A Student's Guide to Type Setting

By Leonard E. Schmidt. Paper, 48 pages, 5⅞ by 8¾ in. Printed at Lincoln Hall, Lincolndale, N. Y.

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Mathematics for Aircraft Engine Mechanics

By Harold Griffiths. Cloth, 365 pages, 5½ by 8½ in., illustrated. Price, $2.50. McGraw-Hill Book Co., New York, N. Y.

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Prepared under the direction of O. I. Schmaelzle. Paper, 131, 6 by 9 in. pages. Published by the board of education at San Francisco, Calif.

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Opportunities for Youth in Air Transportation

By Frances Aves Smith and Nickolaus L. Engelhardt, Jr. Paper, 32 pages, 8½ by 11 in., illustrated. Price, 25 cents. Published by Air-Age Education Research, 100 East 42nd St., New York 17, N. Y.

A helpful booklet for those who have to do vocational counseling. The pamphlet outlines and discusses the many occupations covered by the air transportation industry, lists the qualifications and training required by the various types of employees, and presents suggested preparatory courses.

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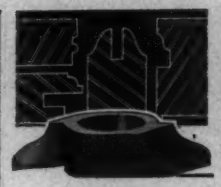

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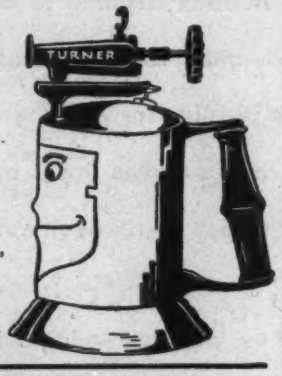

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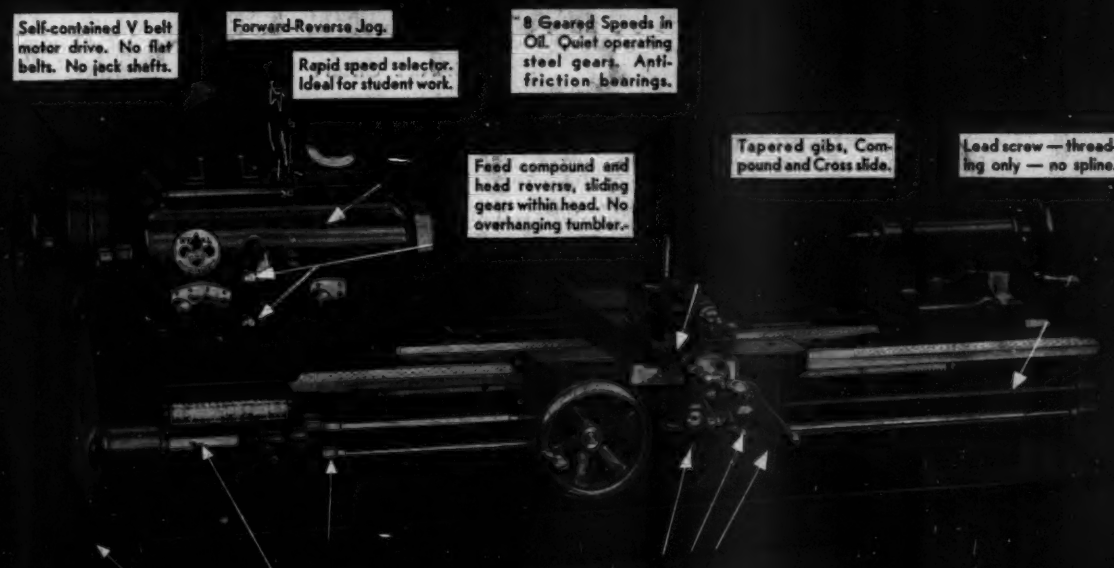

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